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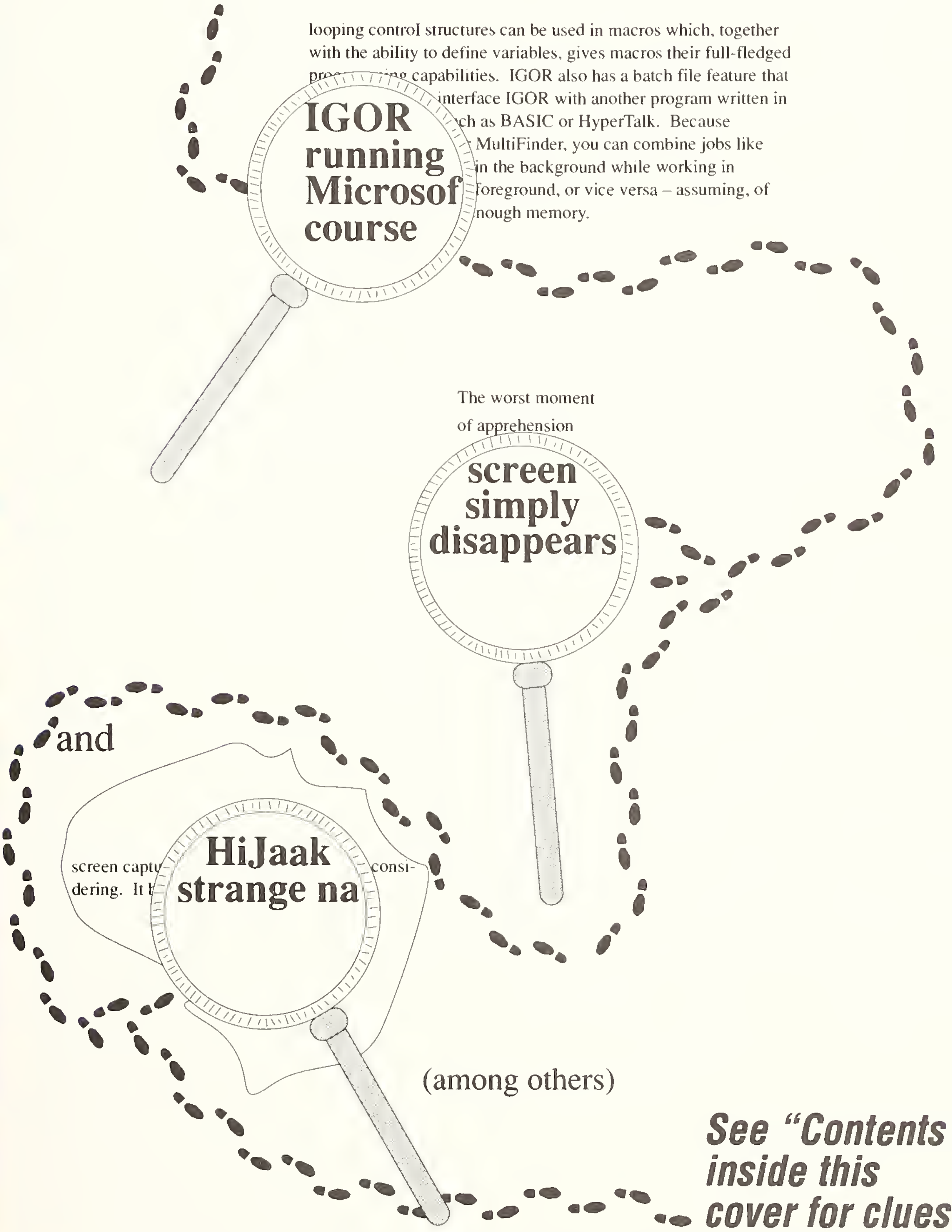
ComputerNews

This month we solve the mysteries of. . .


looping control structures can be used in macros which, together
with the ability to define variables, gives macros their full-fledged
pro capabilities. IGOR also has a batch file feature that
interface IGOR with another program written in
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MultiFinder, you can combine jobs like
in the background while working in
foreground, or vice versa – assuming, of
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IGOR
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Microsof
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The worst moment
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and
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consi-
HiJaak
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(among others)

See "Contents" inside this cover for clues

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WordPerfect 5.1

Harriet Hua Ji
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Improvements of WP 5.1 over WP 5.0:

I have tested the newly-arrived WordPerfect, version 5.1. It displays some impressive new features and improvements. For instance, there is a new Tables feature, a new Equation Editor, and improved Graphics and Columns features. WP 5.1 displays optional pull-down menus on the top row of the text screen and provides mouse support in addition to its traditional function-key access to features. The improved Graphics feature makes the printing of WP's 1,700 special characters a reality on all printers supported by this version. The functions for designing keyboard layouts have been improved. The new Hyphenation options place more accurate hyphens in justified text lines. A change has been made to WordPerfect's List File menu so that it can display long filenames (up to 68 characters), as well as type names (up to 20 characters), for each document. The Setup menu has been expanded. Merge and Macros are easier to use. All this makes WordPerfect 5.1 an easier and more widely-applicable word processor for PC users.

Problems with the First Release of Version 5.1

Unfortunately, my test of WP 5.1 also discovered problems. For example, the speed of editing and formatting sometimes became very slow for no apparent reason. WordPerfect's View Document, and graphics and table printing, are noticeably slower than with the current release of 5.0, even taking into account that printing graphics takes longer than printing text. (The worst moment of apprehension comes when the screen simply disappears after View Document has been chosen.)

The main editing screen does not always rewrite correctly, especially when you have typed in columns. Stray pieces of menus and text appear in strange places from time to time. In one case, a professor in Fine Art could not print text created in the new Tables feature. In another case, a user in the Faculty of Music seems to have lost a large file while using WP 5.1.

The good news is that a new release of WP 5.1 (to fix the problems mentioned above) is being sent to us by WPCorp, although how well it will solve the problems remains to be seen. According to WPCorp, any owner of WP 5.1 on campus has the full right to get the revised version from their dealer for free. When UTCS receives the corrected release, you may get the update through the UTCS Microcomputer Lab at 978-5601.

Two more things can be done to improve the operation of WP 5.1. Increasing the buffers size in your "CONFIG.SYS" DOS file (e.g., Buffers=28) will help speed up version 5.1. If you are using an old Everex graphics cards in your machine you may have problems; upgrading the Everex graphics card is highly recommended by WPCorp.

Summary of WP 5.1's New Features

Tables Feature

The new Tables feature of WP 5.1 is a welcome addition to WordPerfect's tab and column functions. It makes creating tables much easier than the old method of using tabs. Tables can contain up to 32,765 rows and 32 columns of text and data and can be automatically enclosed in graphic lines. You can change the size of the columns and rows in the table and you can reformat the characters, paragraphs, borders, and other elements in the table. You can also perform mathematical functions on the numeric data in a table and import spreadsheets into a table.

HALVA International
Music Box

Country	Units Sold	Gross Sales	Average Price
Brazil	7,000	560,000.00	80
England	10,000	1,250,000.00	125
Japan	12,000	1,800,000.00	150
Holland	20,000	2,400,000.00	120
Iceland	7,000	490,000.00	70
Norway	4,800	960,000.00	200
Thailand	9,000	1,215,000.00	135
Totals	**69,800**	**8,675,000.00**	**124**

$$\frac{d}{dx}\left[n^{\frac{1}{n}}\right]=\frac{1}{n}x^{\left(\frac{1}{n}\right)-1}$$

Equations

WordPerfect 5.1 has included a new Equation Editor that offers more than 60 functions and commands, and more than 300 symbols. The Equation editing screen includes an editing window, a preview area, and a palette which contains math, Greek, and many other types of symbols. With the Equation Editor, you can enter an expression and preview its printed appearance immediately. If you have a printer capable of printing graphics, 5.1 will print every character available in the equation palette as bit-mapped graphic images.

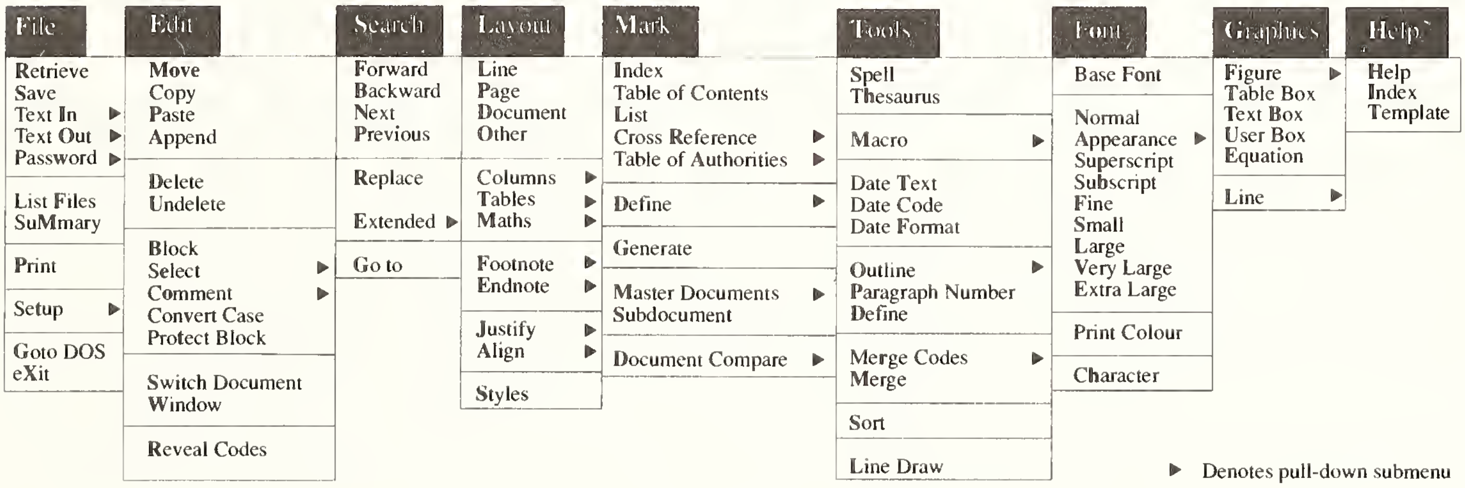
Columns

The improved columns feature can create up to 24 newspaper-style (snaking) or parallel (side-by-side) columns at any place in your text. You can change the spacing within a column or extend beyond a page break when creating parallel columns, which is especially useful for script writing. Also, you can move between columns using Alt-Left Arrow and Alt-Right Arrow, in addition to using Ctrl-Home-Left and Ctrl-Home-Right as in WP 5.0.

Pull-Down Menus and Mouse Support

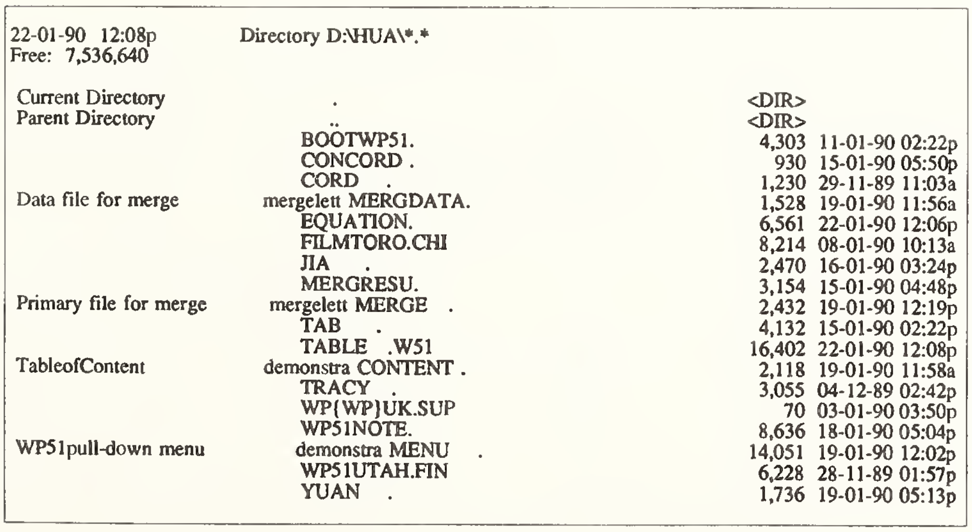
The Macintosh-style pull-down menus and mouse support are impressive new features added to WP 5.1. In addition to the traditional function-key access to WP features, you can now choose to access the pull-down menus on the top row of the text-editing screen by pressing a single key. From the menus, you can select commands using specific alphabetic letters or the arrow keys, before pressing <Enter> to carry out the commands. You can also access the features of 5.1 using a mouse. Mouse use can radically change your way of operating WordPerfect, but it will take some time before you feel comfortable with controlling a mouse for selecting features, moving the cursor, or blocking text.

The Pull-Down Menus of WordPerfect 5.1



Changes in the List File Menu

In WP 5.1, the List Files feature has two major changes in its menu. The "Text In" feature has been replaced by "Short/Long Display." (The Text In function is now available separately under the List Files menu.) With the new Short/Long Display option, you can choose to display long filenames of up to 68 characters and type names up to 20 characters in the List Files screen, as shown at left. (You must already have given your document a long descriptive name and a type name in addition to the traditional DOS name of eight characters plus three-character extension.)



```
22-01-90  12:08p        Directory D:\HUA\*.*
Free:  7,536,640

 Current Directory              .                                        <DIR>
 Parent Directory               ..                                       <DIR>
                                BOOTWP51.                                4,303  11-01-90 02:22p
                                CONCORD .                                  930  15-01-90 05:50p
                                CORD    .                                1,230  29-11-89 11:03a
 Data file for merge   mergelett MERGDATA.                               1,528  19-01-90 11:56a
                                EQUATION.                                6,561  22-01-90 12:06p
                                FILMTORO.CHI                             8,214  08-01-90 10:13a
                                JIA     .                                2,470  16-01-90 03:24p
                                MERGRESU.                                3,154  15-01-90 04:48p
 Primary file for merge mergelett MERGE   .                              2,432  19-01-90 12:19p
                                TAB     .                                4,132  15-01-90 02:22p
                                TABLE   .W51                            16,402  22-01-90 12:08p
 TableofContent        demonstra CONTENT .                               2,118  19-01-90 11:58a
                                TRACY   .                                3,055  04-12-89 02:42p
                                WP{WP}UK.SUP                                70  03-01-90 03:50p
                                WP51NOTE.                                8,636  18-01-90 05:04p
 WP51pull-down menu       demonstra MENU     .                          14,051  19-01-90 12:02p
                                WP51UTAH.FIN                             6,228  28-11-89 01:57p
                                YUAN    .                                1,736  19-01-90 05:13p
```

Long Display of File names (long names in mixed case; short (i.e., regular) filenames in uppercase).

Another change is the "Find" option added to WordPerfect's List File menu. The new option enables you to search for a certain word while in List Files and display only those files that match. The "Undo" command in the submenu of Find can return you to the list displayed before the last search.

Printing Special Characters

WordPerfect 5.1 can print special characters and symbols as graphic characters. As long as you set the Graphic Quality field in the Print menu to “low,” “medium,” or “high,” it will print all of its 1,700 special characters on all printers supported by WP 5.1. You can select “not to print” in the Graphic Quality field to prevent printing of graphics on your printer. Keep in mind that the graphic printing takes much longer than 5.0 or the “not to print” graphic quality in 5.1. The revised versions of WP 5.1 may address this annoying speed problem.

Setup

Setup/Shift has been reorganized and expanded to include setup menus for the mouse, menu bar, and other features. For instance, you can specify the size of the Reveal Codes screen, choose to display the menu bar on the top of your text screen, or set the mouse at a faster speed or as left-handed. WP 5.1 also provides more status prompts to identify every editing substructure on the Status Line. For example, the Status Line will be visible while you are doing a spell check. This is very useful for identifying the position of text that must be edited after the spell check is completed.

Keyboard Layouts

A new feature, “Keyboard Map,” (Shift-F1, Keyboard, Map) has been added to WP 5.1. It can display a “map” of any user-defined keyboard and display all the keystrokes possible on the alpha-numeric area of the keyboard.

WP 5.1 comes with five keyboard layouts in addition to the default: ALTERNAT, ENHANCED, EQUATION, MACROS, and SHORTCUT. You can use the Keyboard menu under Setup to design your own keyboard layout. For instance, [Keyboard] [Map] displays the map of the layout of a chosen keyboard. [Keyboard] [Edit] allows you to redefine the chosen keyboard.

The Macros keyboard maps several useful advanced macros on the Alt-Letter and Ctrl-letter keys. These include Ctrl-F8 for font options, Alt-R for font changes, and Ctrl-G for a Glossary macro.

[Alt-E] on the Shortcut keyboard allows editing of the formatting code the cursor is currently on. The macro takes you directly to the menu used to modify the code. It allows you to make changes in the menu, insert the new code, and delete the old code if necessary.

New Macros

Three new macros are also included in WP 5.1: **“ENDFOOT”** changes Endnotes to Footnotes and vice versa. **“CODES”** prints out the current document and includes all embedded codes. This is much like printing the Reveal Codes screen. **“LABELS”** aids in the the Form Size/Type setup of Avery-brand labels. Definitions for most Avery labels are included. You highlight the desired label and the macro builds the Form Size/Type information for you.

Merge

Merge Codes in WP 5.1 are easier and more descriptive than those in WP 5.0. For instance, the descriptive merging codes such as {END FIELD}, {END RECORD}, and {FIELD} replace the abstract codes of ^R, ^E, and ^F in 5.0. The merge codes can be used inside headers and footers, footnotes and endnotes, and text boxes. You can either hide or reveal merge codes when doing normal text editing.

The merge feature of WP 5.1 also includes a more powerful merge language, much like the WordPerfect macro language. Using the merge language, you can select records based on information contained in specific fields. For example, you can select and merge only the records in which the province field contains "Alberta" and the education level field indicates 12 or more years of education.

Text Out vs. Save

In version 5.1, WordPerfect will no longer use the default document name when using Text Out [Ctrl-F5] to save. This will help eliminate accidently overwriting a WP- formatted file with a DOS text copy. The filename will be offered as the default if you re-save as DOS text. The same is true for normal Save after you have saved a document with Text Out. This will help eliminate the possibility of accidently overwriting a DOS text file with a WP-formatted document.

Adjusting Tabs

Improvements have also been made to the Tab feature. While setting tabs in WP 5.1 on an enhanced keyboard, you can move the cursor between Tab settings by pressing Alt-Left and Alt-Right. While the cursor is placed on a Tab position, the tab stop can be interactively moved left and right with Ctrl-Left and Ctrl-Right. You can also choose to set tab stops relative to the text margin or to the page edge. Setting tabs relative to the text margin allows you to change the page margin size while maintaining the tab settings in relation to the new margins.

Educational Pricing for Campus Users:

One thing I should mention here is that UTCS, with its site-license agreement with WPCorp, offers especially good prices for purchases or upgrades of WordPerferct. Those who are interested can contact the Information Office of UTCS at 978-4990.

Conclusion

WordPerfect 5.1 has arrived! Additional features for creating tables and equations, as well as improvements to graphics, columns, and merge, make WP 5.1 more competitive among the leading word processors in the PC world today. With the new pull-down menus and mouse support, WordPerfect has also caught up to some of the attractive features of the Macintosh, forecasting the trend that WordPerfect is to follow in the future. Yet despite these impressive changes, the first release of 5.1 is not stable, particularly in its graphic features. Until the new version is bug-free, the full potential of WordPerfect 5.1 will not be realized.

SmartForm Designer

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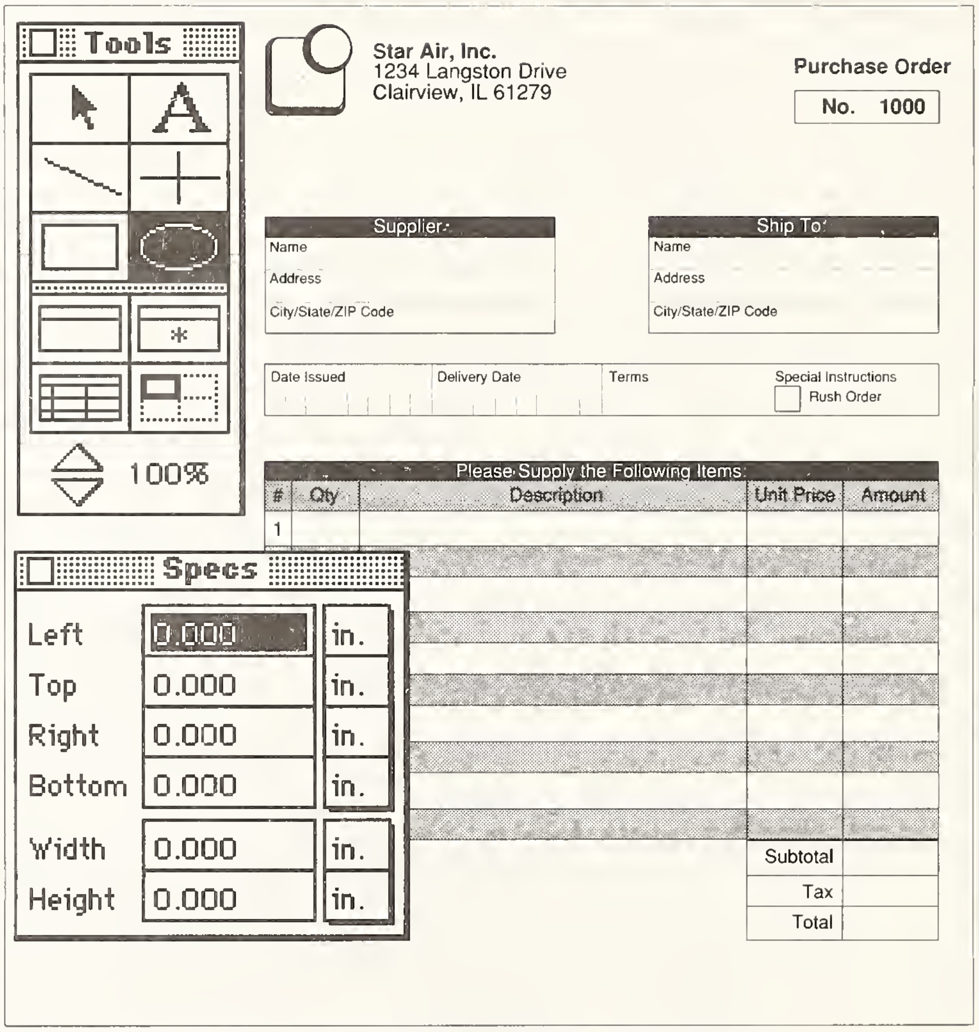
Forms – they're everywhere! Applying for a grant? Registering for a course? Paying income tax? Chances are you will fill in a form. Forms provide a means for the efficient collection of information. Traditionally, forms have been drafted by hand and then typeset. This process has proven to be time-consuming and costly, as changing needs require forms to be updated regularly. Electronic forms design has addressed the problems associated with updating forms, as well as providing the benefits of computerization to forms. If you are a forms designer, then you will find electronic forms designing packages like **SmartForm Designer** from Claris for the Macintosh to be a valuable product.

SmartForm Designer allows you to produce and print forms that will be completed by hand or with a typewriter. SmartForm also allows you to create "intelligent" electronic forms of any design. Automatic calculation and formatting are just two examples of the intelligence that you can add to your electronic form. One copy of SmartForm Assistant accompanies SmartForm Designer; it is used to enter text or data into electronic forms. Additional copies of SmartForm Assistant may be purchased for other users of the forms.

Claris provides a well-paced HyperTour disk for each package. Both the Designer HyperTour and the Assistant HyperTour provide introductions to the capabilities of each application. Each tour is an interactive tutorial leaving you interested in exploring the tools provided. Although sample forms are included on the tutorial disk, the tour is not a source of information for form design.



Star Air, Inc.
1234 Langston Drive
Clairview, IL 61279

Purchase Order
No. 1000

Supplier:
Name
Address
City/State/ZIP Code

Ship To:
Name
Address
City/State/ZIP Code

Date Issued	Delivery Date	Terms	Special Instructions
			☐ Rush Order

Please Supply the Following Items:

#	Qty	Description	Unit Price	Amount
1				
			Subtotal	
			Tax	
			Total	

Specs

Left	0.000	in.
Top	0.000	in.
Right	0.000	in.
Bottom	0.000	in.
Width	0.000	in.
Height	0.000	in.

Figure 1 illustrates a sample form, plus the Tools palette and Specs box.

Similar to other drawing programs, SmartForm Designer provides a Tools palette containing the drawing tools necessary to create the form element by element (*Figure 1*). In addition to the standard drawing tools, tools specific to forms design are provided. The Tools palette contains: a Field tool to create boxes for data; a Special Field tool to create boxes for specific information, e.g., the date; a List tool to create large fields of columns and rows; and a tool for Repeating Groups, e.g., name tags.

Figure 1 also shows a sample form consisting of graphics and data objects. The logo was created using the standard drawing tools and the text tool. The field tool was used to create the address fields. Each field consists of two parts: the label and the data. The Styles feature allows you to position the label within the field.

The appearance of a field may reflect one of several styles. A field may be bordered, underscored, bordered and underscored, bordered and combed, or unbordered and combed. Combed fields can be defined to accept a specific number of digits, e.g., a social insurance number. The "Date Issued" field in the sample form is a combed field. The Set Defaults command allows you to create fields with consistent style settings and graphic attributes. By creating one model field, and setting the defaults based upon that field, all subsequent fields will appear identical without having to select each style attribute. In the sample form, the first field in the address area was created with the label positioned to the left of the data area. Setting the default to reflect this field allows you to produce the second and the third fields with identical styles. In addition to setting the style, the Set Defaults function provides the option to include the field height, allowing fields of uniform height to be produced easily. While fields will have consistent height, the length is not included in the default. The Specs box provides the only means for precisely modifying fields for consistent length. It is not possible to set the default definition type (e.g., integer) of fields; it is necessary to define each field individually. When applicable, lists provide an alternative to defining field types individually.

The Super Duplicate command simplifies the creation of identical fields by allowing you to duplicate a field any number of times. For example, the Super Duplicate command was used to create three fields of identical dimensions for the "date issued," "delivery date," and "terms" fields in the sample form.

The precise positioning of the fields requires use of the Specs box (see *Figure 1*). Vertical and horizontal rulers are available for precise layout. While it is possible to define a grid and have objects "snap to grid," the Specifications display that SmartForm provides is indispensable. The Specs box may be kept on the screen to assist in the precise measurement and placement of fields and graphics. For example, you can adjust the height of a field by typing in a new value. Without the specification display, the precise positioning of elements would be extremely time consuming. However, it is important to note that while the dimensions of a field can be altered by typing in a new value, the Specs box cannot be used to reposition a field without misshaping it.

The organization of related information into rows and columns is achieved with lists. Itemized lists are added to the form with the List tool. The List tool draws a frame for the list and a list ruler appears allowing you to create columns. Columns within a list can be defined to display data as a decimal number, as currency, or as a percentage. In the sample form the "unit price" and "amount" columns are defined to display data as currency. The list is made more attractive by filling every other row with a pattern.

The box adjacent to "rush order" in the sample form is a check box. Check boxes may be included, as well as boxes that will display variations of Yes and No, or True and False, as answers. While check boxes are advantageous in forms design, SmartForm does not provide a default size for them. You have to use the Specs box to modify the fields to identical dimensions. SmartForm has strong information-handling capabilities. It has the ability to add "intelligence" to your form. This is useful if the form you are designing is to be completed electronically. Fields, lists, and columns can be created to accept specific information and to perform calculations. Also, fields can be designed to automatically transform data to a specific format.

The ability to automatically perform calculations is one of the most useful intelligence features available in SmartForm Designer. When a field is defined as a computed data object, SmartForm Assistant automatically fills it. SmartForm Assistant performs calculations based on formulas that you define. Formulas are frequently created to calculate sales tax, totals, and subtotals in a form. For example, the "amount" column in the list is defined to automatically compute the quantity multiplied by the unit price, and the subtotal field (below the list) is

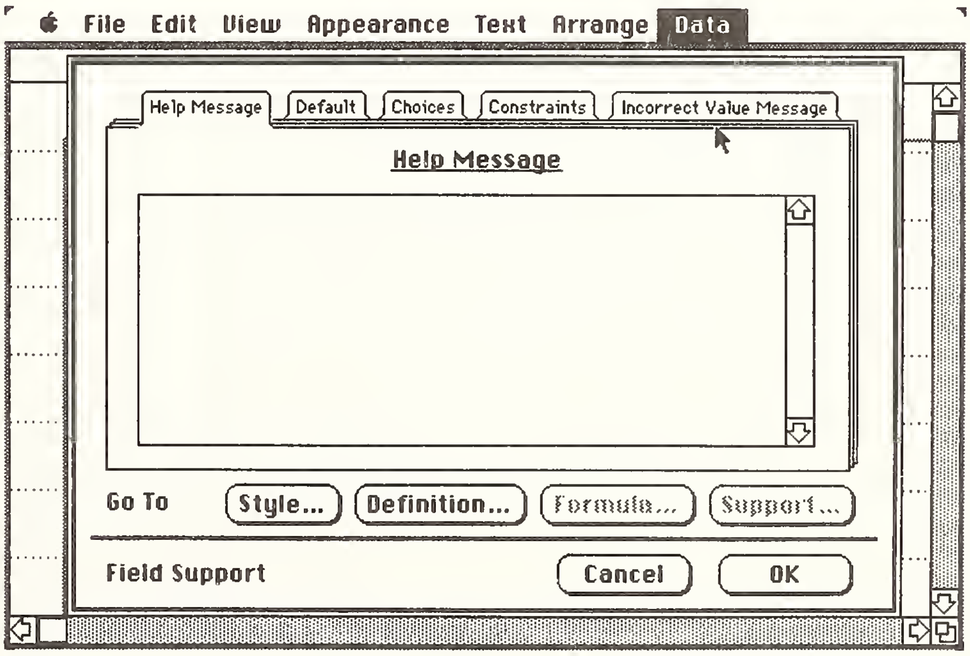


Figure 2: Cards in the Support Dialog Box.

defined as the sum of the figures in the amount column. Formulas may be created using a variety of operators and functions. During form completion, information is generated automatically based on the formula that you have defined.

SmartForm Designer allows you to build support into a form as well. The Support Dialog box provides cards where a variety of information can be stored. Cards are provided for Help, Defaults, Choices, Constraints, and Incorrect Value messages (*Figure 2,* on previous page). When using SmartForm Assistant, support messages appear in floating windows that provide assistance during form completion. In addition to help messages, a list of valid choices may be included in the design of each field, to be displayed in a separate window. Constraints may also be defined. If the SmartForm Assistant user enters information that does not match the constraints of a field, the incorrect value message (that you create) will be displayed. Another useful feature is the ability to set default responses. If the expected value for a field is "X" then "X" can be specified as the default response for a field. The SmartForm Assistant user can change the data in the field if necessary.

Special fields may be defined to generate particular information. The Special Field tool allows you to create fields that automatically provide information when a form is completed, printed or modified. The purchase order field in the sample form was created using the special field tool. One of five types of information can be displayed in a special field. The current date, time or page number, a counter (number increasing with each form completion) or a part label ("customer copy" on a multipart form) can be generated automatically.

If you are creating a multi-page form, the Master Page feature allows you to place elements (e.g., a logo) that will appear on all pages.

Once a form is created it can be printed to be completed by hand or with a typewriter. If the form is to be completed electronically, you open a copy of it in SmartForm Assistant.

SmartForm Designer provides the opportunity to complete existing forms using the Macintosh and a printer, thereby eliminating the need for a typewriter. The SmartForm Assistant user then has the option to print the form data only on the existing form. Despite the numerous tools provided, it is difficult to create a form to match an existing form without scanning it. Existing forms may be scanned; however, using a scan of a form also presents obstacles.

Claris claims that scanned images of existing forms can be saved as PICT files and incorporated into the master page using the Insert File command. The form can then be used by creating data objects on top of the scanned image. However, SmartForm is limited in the size of the PICT file that can be imported. Furthermore, once a copy of the scanned image has been pasted into the form (via the clipboard) it requires a great deal of cleaning up. Data objects created on top of the corresponding areas of an untouched scanned image create a very distorted and confusing form. Unfortunately, SmartForm does not provide the tools required to touch-up the scanned image to the extent required. Therefore, scanned images must be touched-up in a drawing program, then pasted from the Clipboard or Scrapbook into SmartForm Designer.

Although the logo in the sample form was created using the drawing tools, graphics such as business logos may be imported into the form. Scanned images saved as EPS files may be imported into SmartForm Designer using the Insert File command. Pasted graphics may be resized by dragging a selection handle or entering precise measurements in the Specs box.

While many command-key equivalents are available, those of you who favour keyboard shortcuts will not find SmartForm Designer to be hassle free. For example, aligning text is a formatting feature used frequently in form creation, yet a command-key sequence exists for only one alignment option.

Before printing your form, you can reduce it to fit in the window. Although difficult on a 9-inch monitor, it is possible to edit the form in this reduced view. The scaling tool allows you to scale your form down to 50% or 25% of its original size. You can also enlarge it to 200% or 400%. Immediate feedback on format design is also provided. The Show Sample Data command allows you to view the form as it would appear if completed in SmartForm Assistant.

The tab key is used to move from field to field when completing the form in SmartForm Assistant. By default, the form is completed from top-left to bottom-right; however, SmartForm provides you with the opportunity to set any tab order. Once a form is complete, you have the option of exporting data from fields, lists and repeating groups. For example, the contents of a list may be exported into Excel using the comma-delimited format.

If you currently create simple forms, complete paper forms, and key relevant information into another application, SmartForm may be of assistance to you. However, SmartForm is not the answer to complex forms design. If future releases of SmartForm Designer address the current obstacles, SmartForm could play an important role in office form automation.

HiJaak

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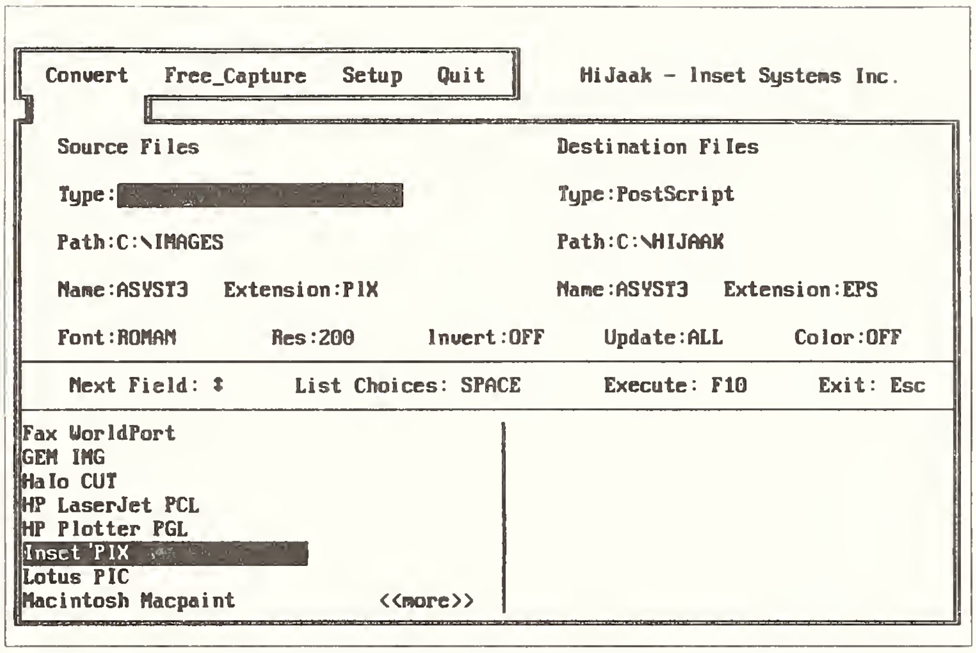
HiJaak is an MS-DOS-based graphics conversion utility that we use often at UTCS.

HiJaak's two main functions are graphics capture and graphics conversion. The capture part of the program allows you to capture screen images or printer streams. UTCS uses the screen image capture to show, in *ComputerNews*, for example, actual screens from programs we evaluate. Printer stream capture allows you to capture output destined for an HP LaserJet printer and save it in a disk file. This output can be either sent to the printer at a later time or converted to a form that can be imported into word-processing and desktop publishing programs.



```
Source Files                              Destination Files

Type:                                     Type:PostScript

Path:C:\IMAGES                            Path:C:\HIJAAK

Name:ASYST3   Extension:PIX               Name:ASYST3   Extension:EPS

Font:ROMAN       Res:200      Invert:OFF      Update:ALL      Color:OFF

Fax WorldPort
GEM IMG
Halo CUT
HP LaserJet PCL
HP Plotter PGL
Inset PIX
Lotus PIC
Macintosh Macpaint          <<more>>
```

HiJaak convert window showing partial list of source file types on the left, plus the destination file format – PostScript – on the right.

The graphics conversion part of HiJaak allows you to convert to and from various formats of graphics files commonly found in the MS-DOS environment. Compuserve GIF, PC Paintbrush PCX, Tag Image File Format (TIFF), Lotus PIC, Hewlett-Packard Graphics Language (HPGL), Encapsulated PostScript (EPSF), and a variety of FAX file formats are supported. Some formats are supported as "output only," such as EPSF. Others are "input only," such as PIC and HPGL.

HiJaak is menu-driven and easy to use. The documentation is good; the initial setup is easy. It costs about $150, if you buy it locally. If you want to use graphics files from programs incompatible with your word-processing or desktop publishing package, or if you need a strong screen image or printer screen capture tool, then HiJaak is worth considering. It has a strange name, but HiJaak is a capable little program. For more information about HiJaak contact Terry Jones at 978-4924.

January/February *ComputerNews* Delay

Patricia Hood
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What a way to start 1990: the January/February issue of *ComputerNews* was late! Our attempts to resolve the problem of substandard printing in the January/February *ComputerNews* delayed the mailing of that issue. Quality should be back to its usual high level with this issue. Thank you for your patience.

Printing Flexibility: The PacificPage PostScript Cartridge

Terry Jones
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With the assistance of Northwest Digital, which loaned UTCS the cartridge, and Professor Roweis of the Department of Geography, who graciously allowed us to use their LaserJet Series II printer, I recently tested the PacificPage PostScript cartridge. This is a plug-in cartridge (similar to a font cartridge) for the Hewlett-Packard LaserJet Series II printer. It allows PostScript printing on a non-PostScript printer. The cartridge requires a Series II printer with an additional 2 megabytes (MB) of memory and sells for about $699 locally.

I tested the cartridge with a number of PostScript files from different applications. I used WordPerfect 5.0 for text applications and Corel Draw 1.1 under Windows 286 for graphics.

Printing Text

From WordPerfect 5.0, the PacificPage cartridge printed noticeably slower (between 50-75% of the printer's normal speed) than the LaserJet in its native PCL (Printer Control Language) mode. There was a pause after each page printed, while the next page was formatting. The trade-off, here, is that the cartridge allows you to print documents formatted for a PostScript printer, enabling you to use an almost infinite variety of fonts and type sizes. Large letters and special effects for posters and announcements can be done easily. Doing the same with a LaserJet and cartridge or soft fonts can be a test of patience and organizational skills. Even then, in many cases, larger letters are not possible without something like the PostScript cartridge being reviewed here.

Cartridge & Soft Fonts vs PacificPage

Cartridge fonts are memory cartridges that plug into the front of the printer. These contain Read Only Memory (ROM) chips that are preprogrammed with fonts. Each cartridge contains particular sizes of specific fonts. Once a cartridge is plugged into the printer, all the fonts it contains may be used in documents sent to the printer. Soft fonts are font descriptions, stored on disk, that allow you to make many different sizes of a font. After you make a particular size of a font, it resides on your hard disk. The greater the number of sizes you create, the larger the amount of hard disk space you must dedicate to soft fonts. When you want to print using soft fonts, you send the font descriptions to the printer and then you print the document that uses those fonts. Creating fonts can be a slow process and sending large fonts to the printer can be time-consuming. While soft fonts give you great flexibility in font size selection, it is at the expense of speed and hard disk space. Cartridge fonts give great convenience and speed at the expense of flexibility. As an alternative, the PacificPage PostScript cartridge gives you all of the advantages of soft fonts and some of the advantages of cartridge fonts!

Printing Graphics

In graphics mode, the PacificPage cartridge proved to be very slow. I used a COREL DRAW sample file of a pool table and a poster with text and graphics as test files. The pool table took a total of 7 minutes to print with the PostScript cartridge and 6 minutes without the cartridge. It had complex fill patterns and was, in fact, a colour picture (the colour was simulated on the laser printer using shades of grey). Although slightly slower with the PostScript cartridge, the quality of the output was much higher (*Figure 1*). The non-PostScript printout (*Figure 2*) was darker overall, some colours were not differentiable, and the complex fills had more obvious banding where one shade of grey ended and the next began.

The poster file was a relatively simple-looking page with some large (1.25 inch) rotated text, a few .5 inch headings, and a scanned image of the U of T crest (see *Figure 3*). After 34 minutes without results, we terminated this print test of the PacificPage PostScript cartridge. With the LaserJet in native PCL mode, COREL DRAW printed the same file in 12 minutes. The PacificPage cartridge did not perform well with scanned images.

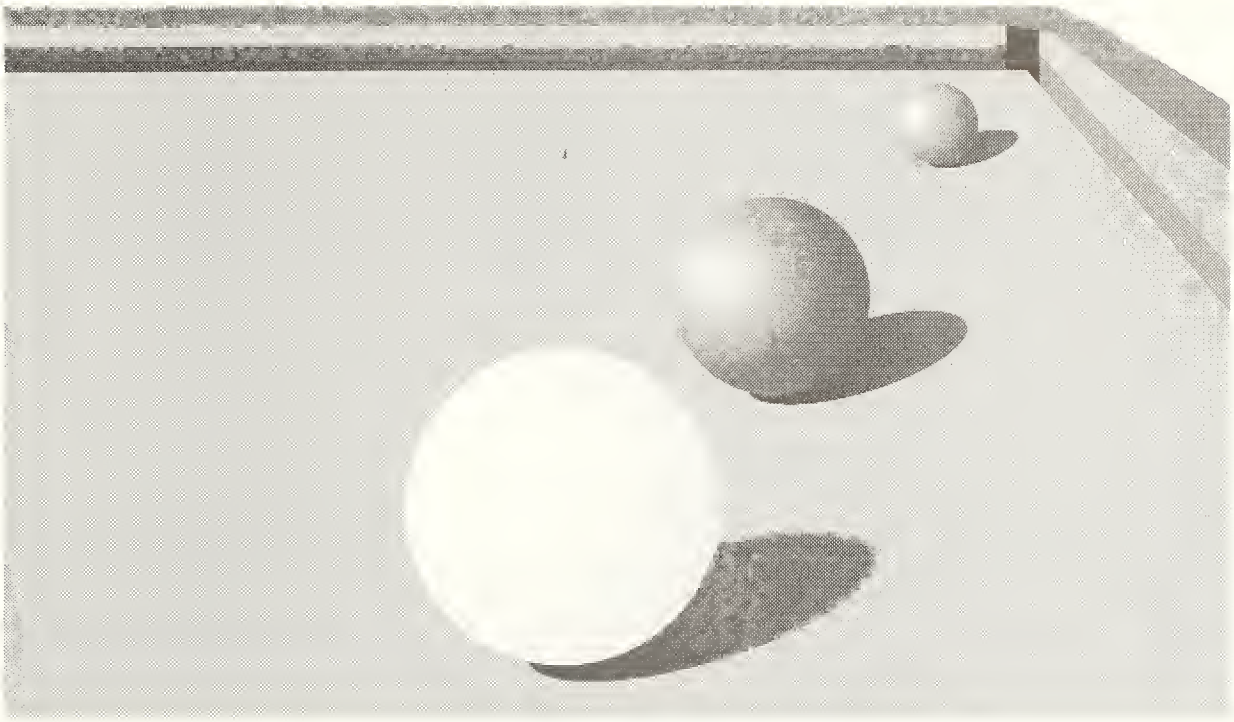


Figure 1: Graphics file printed with PacificPage PostScript Cartridge.

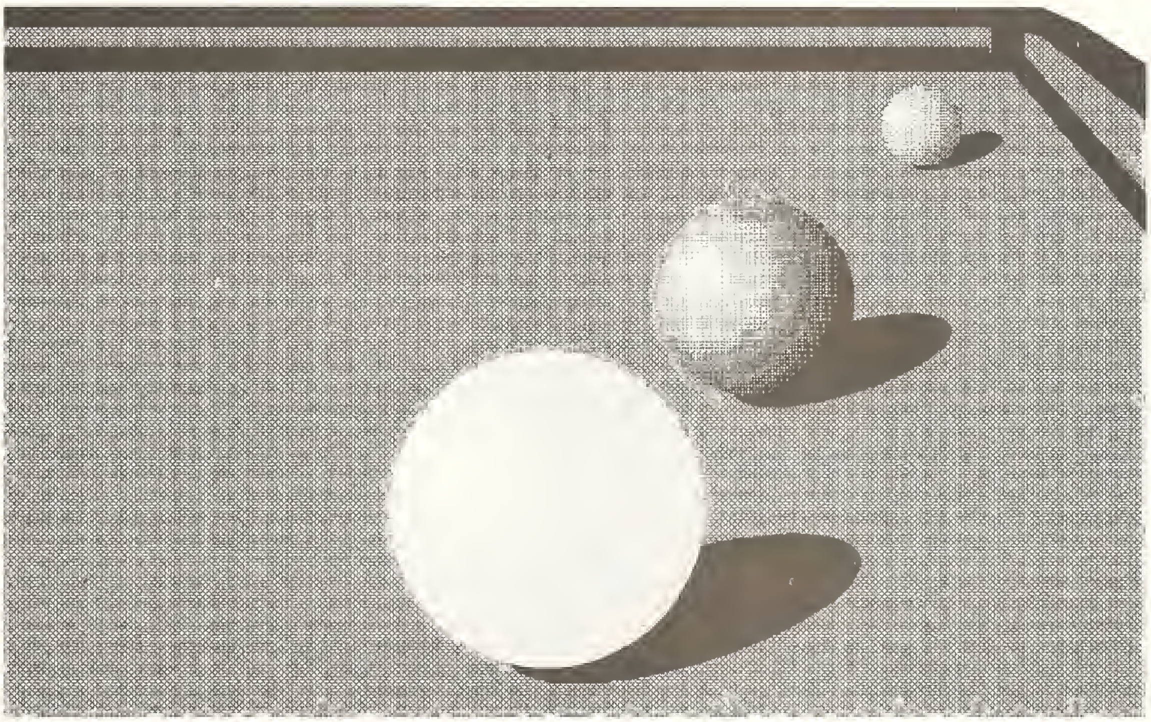
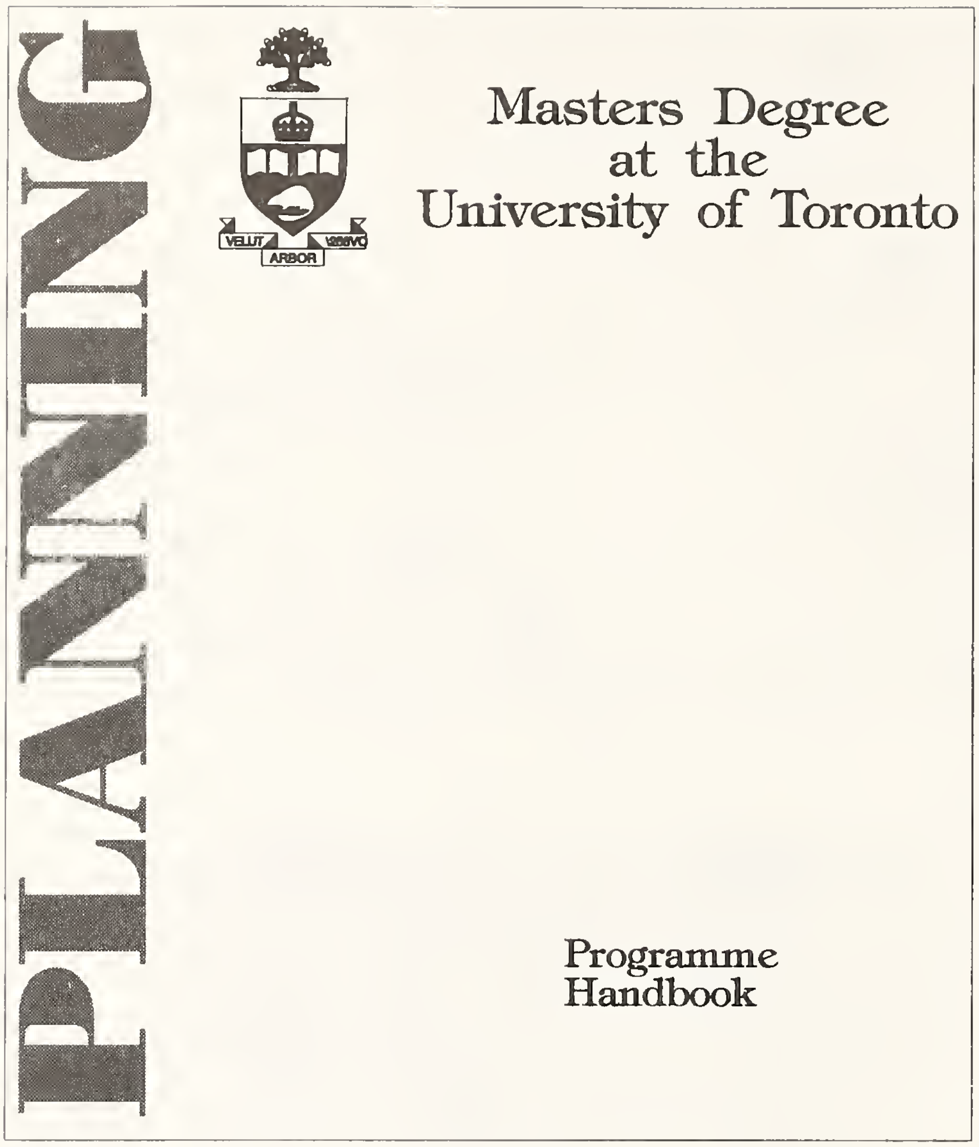


Figure 2: Non-PostScript printout of Figure 1.

One reason for the slowness of printing with the PacificPage cartridge is that the cartridge uses the processor in the laser printer to do all the work. The cartridge consists of ROM chips containing the font descriptions and the PostScript language program. There is no coprocessor to boost performance.

Although slower in all tests, I don't rule out the use of the PacificPage cartridge. There are advantages that make it a valid upgrade option. First, the low price of $699 for the cartridge plus $600 for a 2 MB printer memory expansion gives you PostScript compatibility if you have already invested in the HP LaserJet Series II printer. This is a far cry from the $4000 (minimum) you would pay for a full PostScript printer these days. Second, flexibility in selection of font sizes is quite an important feature You don't have to worry about which sizes of fonts you have available when doing your design work. PostScript fonts scale to the size you specify. Third, the ability to print Encapsulated Post-



PLANNING

Masters Degree
at the
University of Toronto

Programme
Handbook

Figure 3: The page that would not print.

Script images provides somewhat more flexibility when importing and exporting graphics between programs. Finally, with the PacificPage cartridge you can switch back and forth between PostScript mode and PCL mode, easily choosing the mode that works best for a particular application.

It is worth noting that the PacificPage cartridge is a PostScript-compatible cartridge as opposed to a true Adobe PostScript cartridge. This is a problem when purchasing typefaces. Certain Adobe and third-party typefaces may not work with the PacificPage cartridge. If the built-in typefaces are not adequate for your needs, you should probably consider a true Adobe PostScript printer instead.

The PacificPage cartridge I tested would NOT work in the LaserJet Series IIP (the new 4-page-per - minute $1500 personal laser printer). A version for the IIP has apparently been recently released and is reviewed in *Seybold Outlook on Professional Computing,* December 1989.

All in all, I would recommend the PacificPage cartridge if you have an occasional need for large fonts, complex graphics, or printing of Encapsulated PostScript graphics. If you have more than an occasional need, then you should consider a true PostScript printer.

University Fiscal Year-End

Marg Doherty
marg@utcs.utoronto.ca

Users are reminded that the University Fiscal Year-End is April 30, 1990. This means that all blanket orders (Encumbrance Memos) raised for computing on a Departmental Appropriation Account (Ledger 1) will expire with the approach of that date.

The Comptroller's Office has given UTCS a billing close-off date of April 24, 1990 for charges to blanket orders. Therefore, the last day for accruing charges to be applied to the blanket order is April 21, 1990. Charges for the remaining few days of April (April 22 through April 30 at 5:00 p.m.) will be billed in May.

In order to achieve uninterrupted service over the year-end, account administrators are advised to do the following:

1. Supply the Accounting Services Office with a blanket order (Encumbrance Memo) for the new budget year by April 15, 1990. It should clearly show the Customer Account Number (CAN) holder's name, the Customer Account Number, the dollar amount, and the 1989/90 Encumbrance Memo number that it is replacing. In the case of a new account, where the CAN and previous Encumbrance Memo number are not available, "NEW ACCOUNT" should be indicated.
2. Service Access Codes (SACs) should be checked to determine whether they are required in the new year. If they are, the expiry date should be checked and changed if necessary.
3. Spending limits are another important consideration. If total spending limit and usage to date require changes, this information should also be communicated before the end of April.

The discussion thus far has dealt mainly with the year-end situation as it normally affects instructional and administrative users. Researchers are also affected by the expiration of departmental subsidy blanket orders.

Account administrators are encouraged to discuss any doubts or difficulties arising with accounts or access codes at anytime by calling the Accounting Services Office at 978-7148.

Mail should be addressed as follows:

UTCS Accounting Services
4 Bancroft Avenue, Room 100B
University of Toronto

If you prefer to pay us a visit, we are at this address from 9:00 a.m. to 5:00 p.m., Monday through Friday.

The MeMo Project

Geoffrey Rockwell
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The Faculty of Library and Information Science, the University of Toronto Library and University of Toronto Computing Services (UTCS) have been working together to create a tutorial program for the University's on-line library catalog. Designed to run unattended on Macintosh computers in libraries, the tutorial is a collection of HyperCard stacks that will teach the fundamentals of searching on-line catalogs, like FELIX.

The Mental Models project, MeMo for short, is a research project started by Joan Cherry, Assistant Professor in the Faculty of Library and Information Science, and Peter Clinton, Associate Librarian, Reader Services, University of Toronto Library. They want to determine whether teaching the theory behind all on-line catalogs would help people better understand the one they actually use. They hope to provide a "mental model" of the available service, so that users will be able to anticipate how to run it. Consequently, parts of the MeMo stacks deal with on-line library catalogs in general, not just FELIX.

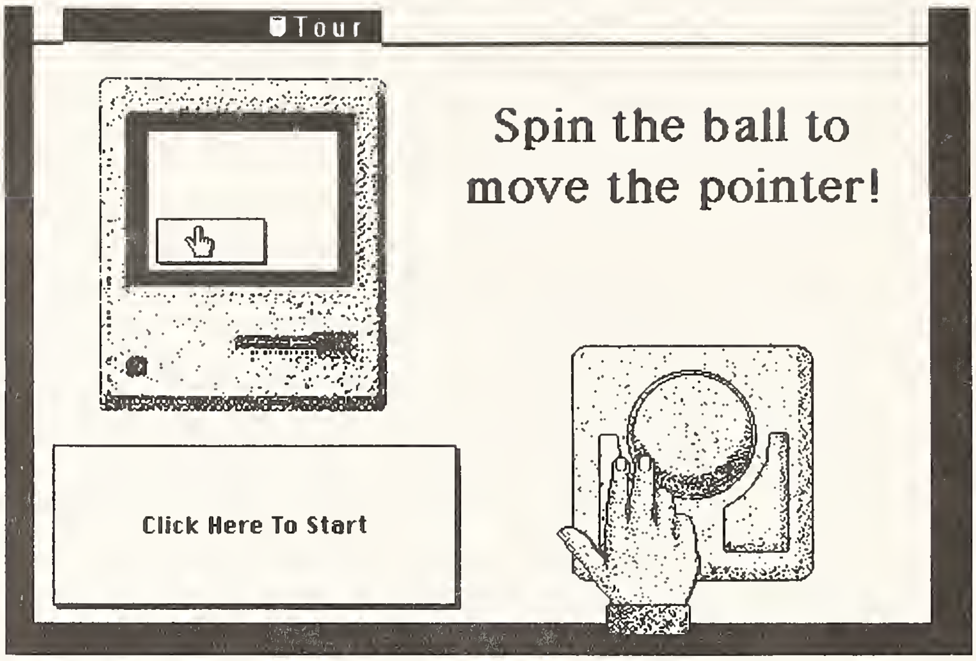
The Library is interested in utilizing the MeMo project to train users to use FELIX. Sophia Kaszuba, a librarian with the University of Toronto Library, did most of the programming for the current version of MeMo. She added modules that deal explicitly with FELIX, showing the user what the screens mean and how to search for a particular author. Basically, the MeMo stacks are an expandable resource for providing Library users with information. The collection of stacks will not replace other information resources, but will supplement them.

UTCS provided the initial design and trained the programmers. Because of our interest in design, we want to develop an information interface that could be used by anyone interested in setting up such an information resource in the University. In effect, we created a template into which information providers can put their local information, and still have it resemble other programs around campus. We would like to encourage consistency, where applicable, across the University. As students become used to the MeMo interface, it makes sense to reuse it so that they will not have to learn different ones.

We are particularly interested in designing a freestanding interface that would be both inviting and easy enough to use without assistance. The process of designing MeMo and assisting the Library taught us just how difficult this is. We had to begin with the assumption that library users might not even know how to use a mouse or trackball. The resulting interface that you see around the campus is a first attempt to define a useful standard for the University.

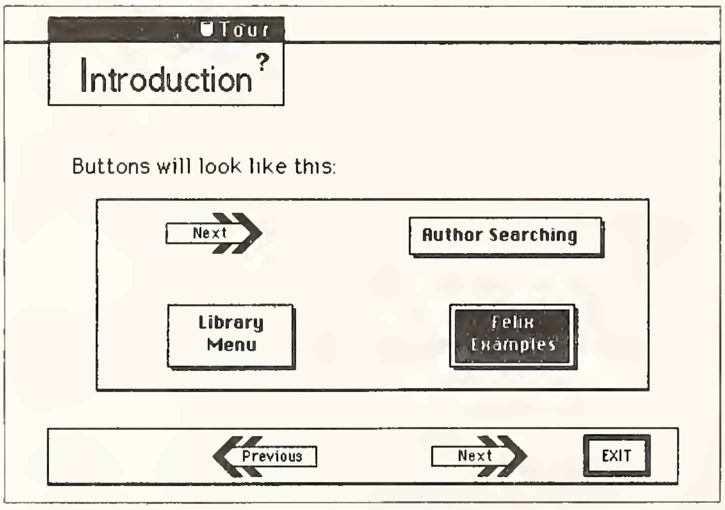
You can explore the MeMo project at any of the following locations: Robarts Library, Science and Medicine Library, Sigmund Samuel Library, Earth Sciences Library, and the Engineering Library. The stacks are designed to be used without supervision or help, so feel free to play with them. If you want to build a similar application, come and talk to us. We can provide templates, discuss our own experience, and train your programmers.

For more information about the MeMo Project, contact Geoffrey Rockwell at 978-4548.



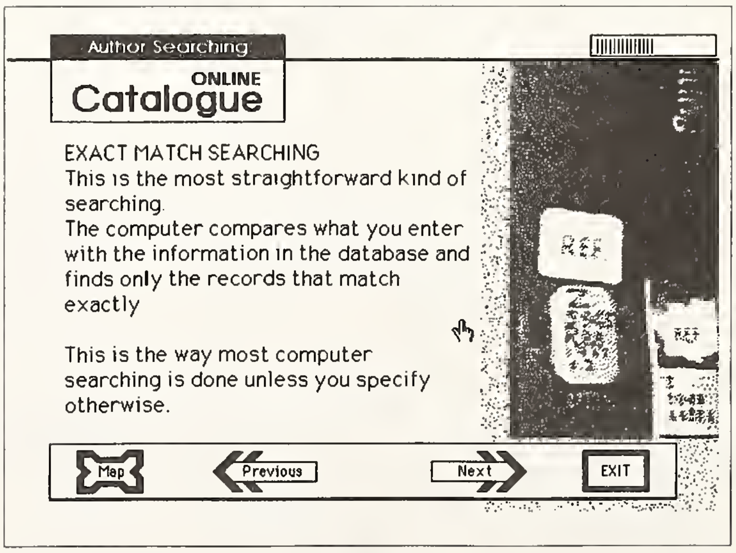
Spin the ball to move the pointer!

This is the first card of an animated introduction to the Memo Stack. Users are shown how to use the track ball to move the cursor, and how to click on a button.



Buttons will look like this:

This card from the Introduction section show the various types of buttons that will appear in the MeMo Stack.



EXACT MATCH SEARCHING
This is the most straightforward kind of searching.
The computer compares what you enter with the information in the database and finds only the records that match exactly

This is the way most computer searching is done unless you specify otherwise.

This card from the MeMo Stack explains search procedures. The control bar at the bottom of the card appears throughout the stack, allowing the user to navigate independently.

The TAB — Refining Your Alignment

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The "tab" is probably the most misused character in any word-processing package (moreso on the PC than on the Macintosh). In the UTCS Micro Lab we see many users who have used the tab improperly. They then spend considerable time reformatting their text because it prints incorrectly on the laser printer, even though it looked perfectly fine on a dot matrix printer or on the screen.

Even if you don't want to read any more of this article, simply keep this rule-of-thumb in mind: If you're going to set up tables, create indented text, produce itemized lists, or align text for any reason, USE TABS. If you don't, every time you add or delete text, change margins, or change font and type sizes, you will also have to spend time realigning the text you should have tabbed.

However, before we delve into this topic too deeply, I'd like to review our knowledge of font characteristics. Fonts have names and each font has a specific design or appearance. Here are some typical examples:

Times
Courier
Helvetica
Palatino

Almost all word-processing packages allow you to specify a font to meet your requirements. If you do not select a font, a default font is used. In WordPerfect and Microsoft Word, the default font depends on the printer you have selected.

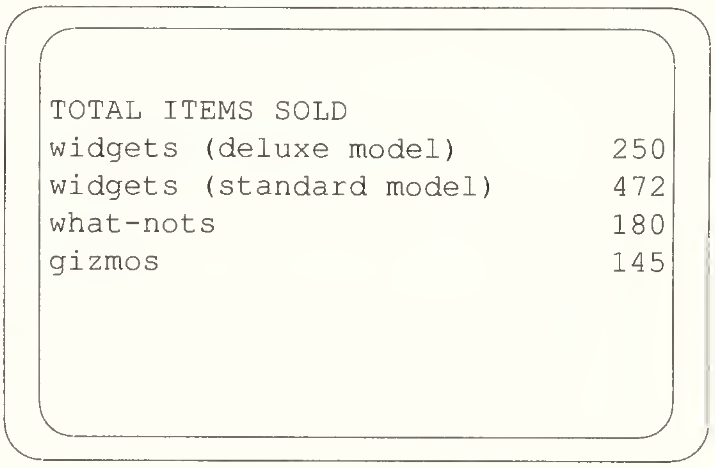
With regard to tabs and text alignment, it is the proportional or non-proportional nature of a font that has the greatest impact. Proportional fonts have different "widths" for different characters. As the examples below illustrate, the letter " i " does not take as much (horizontal) space as the letter " w."

Times (proportional)	Courier (non-proportional)
iiiii	iiiii
wwwww	wwwww
i i	i i
w w	w w

Figure 1: Proportional versus non-proportional text.

Non-proportional fonts, however, have the same width for all characters. In the non-proportional Courier font, the five i's take up as much horizontal space as the five w's. The last two lines of the above example demonstrate that even the three blank spaces between letters have a defined width.

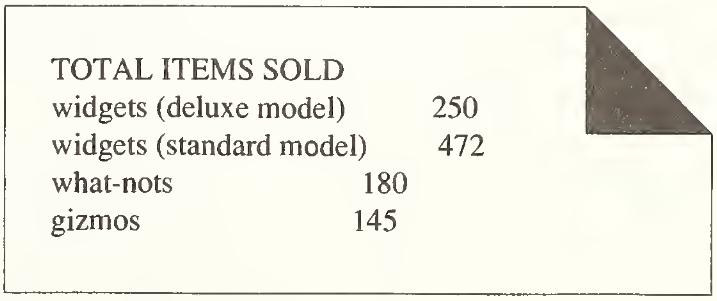
Now, to return to the tab discussion, let's look at how "not" using tabs can cause problems. *Figure 2* shows a simple table as it might appear onscreen in the PC versions of WordPerfect or Microsoft Word.



```
TOTAL ITEMS SOLD
widgets (deluxe model)          250
widgets (standard model)        472
what-nots                       180
gizmos                          145
```

Figure 2: Non-proportional screen display of a table aligned with spaces.

In *Figure 2*, the gaps between the text (on the left) and the numbers (on the right) are filled with spaces (i.e., pressing the space bar a number of times to get the desired alignment). Up to this point, the table looks fine — the numbers align perfectly. However, the reason the alignment is so easy to achieve with spaces is that both WordPerfect and Word use non-proportional fonts for their screen displays. Neither word-processor gives you the option of displaying true, non-proportional fonts during the text-entry phase. If you select a proportional font for printing, then the text in *Figure 2* will print as shown in *Figure 3*.

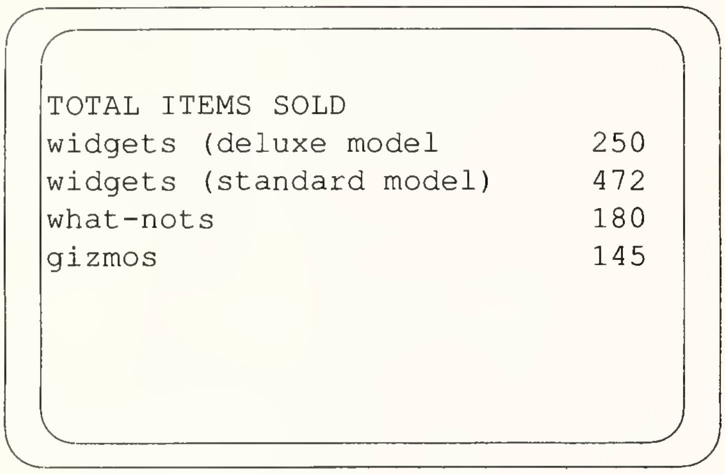


```
TOTAL ITEMS SOLD
widgets (deluxe model)          250
widgets (standard model)         472
what-nots                  180
gizmos                    145
```

Figure 3: Table printed with proportional font.

Clearly, this is not what is desired. You can try to correct the problem by inserting extra spaces between the item name and the amount sold, but you have to print the table each time to tell if it is correct. (Keep in mind that WordPerfect has a View Document mode which shows you onscreen what the printed page will look like. In Word 5.0, you use Print Preview. Though these "print previews" save paper, switching many times between preview mode and entry mode can be annoying.)

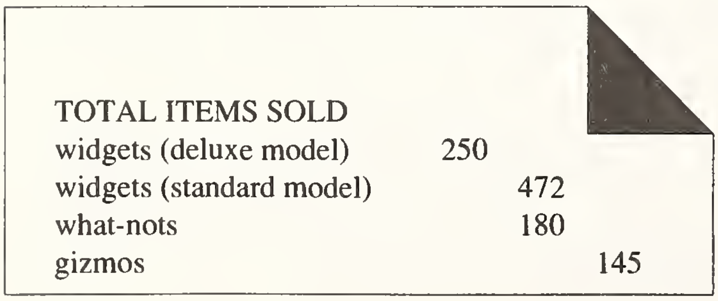
You can, of course, avoid the whole problem by never using proportional fonts. However, proportional fonts are more attractive, easier to read, and use less space (resulting in fewer pages for a given document) than non-proportional fonts. Instead, you should use tabs to solve the alignment problem. Using the default tab settings of the word-processor (usually every half inch, starting from the left margin), we re-enter the table. *Figure 4* shows how it will appear on screen.



```
TOTAL ITEMS SOLD
widgets (deluxe model           250
widgets (standard model)        472
what-nots                       180
gizmos                          145
```

Figure 4: Screen display of table aligned with multiple tabs.

Now that there are tabs between the text and the numbers, the table (when printed in a proportional font) would appear as in *Figure 5*.

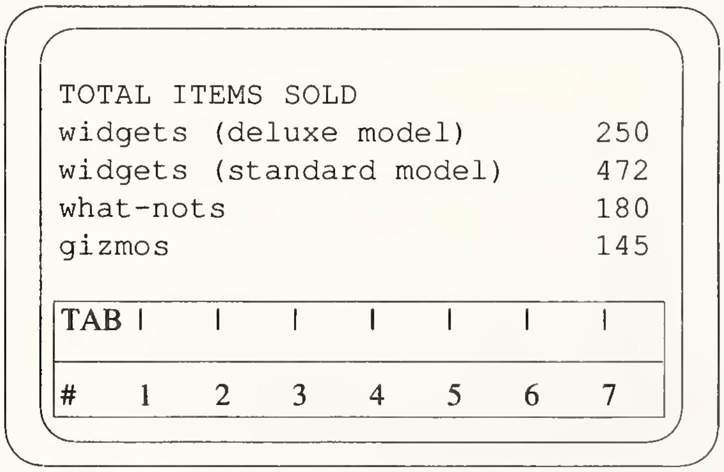


```
TOTAL ITEMS SOLD
widgets (deluxe model)        250
widgets (standard model)           472
what-nots                          180
gizmos                                  145
```

Figure 5: Tabbed table printed with proportional font.

Unfortunately, even when using tabs you cannot use the screen display as an accurate indicator of how the table will print. To understand the problem you have to understand how word-processors treat tabs. Most word-processors store the tab as a single keystroke. This single keystroke does not represent a specific number of spaces. Rather, it is an instruction to the word-processor to "move" to the right until the next tab location, or "setting," is encountered. The actual distance moved will depend on the current tab settings and where you are in the text line when you press the tab key. You must take into account the length of the text when aligning with tabs.

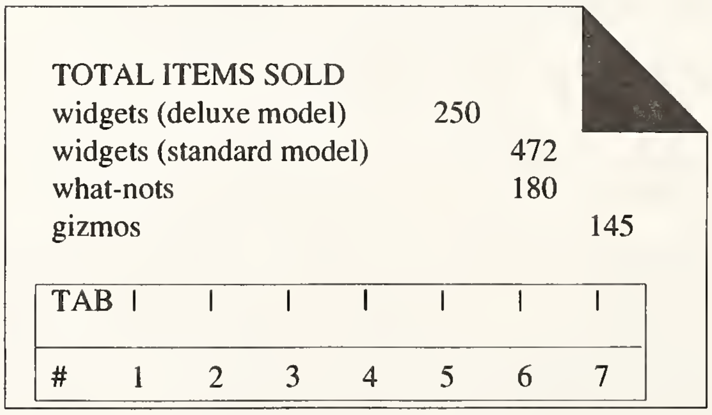
As we discovered in *Figures 2* and *3*, the screen text in a non-proportional font takes up more horizontal space than the printed text in a proportional font. This is more noticeable for long text strings (i.e., the widget lines) than for short strings (i.e., what-nots and gizmos). If you look at the length of the text strings in relation to the tab settings, you begin to see why the printed tabbed text in *Figure 5* doesn't align correctly.



```
TOTAL ITEMS SOLD
widgets (deluxe model)          250
widgets (standard model)        472
what-nots                       180
gizmos                          145

TAB |    |    |    |    |    |    |
#   1    2    3    4    5    6    7
```

Figure 6 : Screen text with tab positions displayed.



```
TOTAL ITEMS SOLD
widgets (deluxe model)        250
widgets (standard model)           472
what-nots                          180
gizmos                                  145

TAB |    |    |    |    |    |    |
#   1    2    3    4    5    6    7
```

Figure 7: Printed table with tab settings for reference.

In *Figure 6,* the default tab settings are shown in the box below the table: the first line shows the tab setting positions with vertical lines while the second line numbers the tabs for reference purposes. Remember that tab positions are absolute distances from the left margin and do not depend on the font used.

Let's look at the "widgets (deluxe model)" line. In the non-proportional (screen) font, the text ends somewhere between tab 5 and tab 6. To "move" to tab position 7 we would have to press the tab key twice. However, in the proportional (printed) font the equivalent text is somewhat "narrower" and thus ends somewhere between tab 3 and tab 4. Two tabs only "moves" us to tab 5. To fix the table, you could simply insert two extra tabs in the widget line to get the desired (printed) alignment, even through the screen text will not appear aligned. (To align the entire table, you also would have to add a tab to the "widgets (standard model)" and the "what-nots" lines.) A better solution is to set only the tabs you need.

```
L....L....L....L....L....L....L....L....L....L....L....L....L....L
|    ^    |    ^    |    ^    |    ^    |    ^    |    ^    |    ^
1"        2"        3"        4"        5"        6"        7"
Delete EOL (clear tabs); Enter Number (set tab); Del (clear tab);
Left; Centre; Right; Decimal; .= Dot Leader; Press Exit when done
```

Figure 8: The tab ruler in Wordperfect 5.0.

Our table consists of only two columns: the product names aligned at the left margin and the numbers sold tabbed to the right. Because the left margin is already set, you need set only one tab to correctly align the table. Here's how to do it in WordPerfect 5.0:

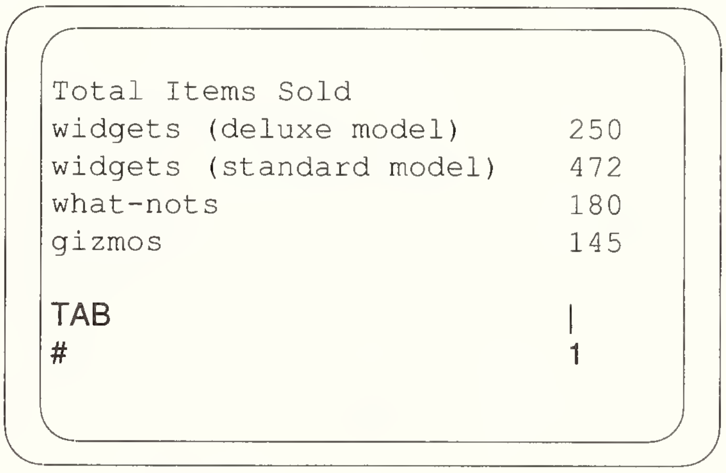
1. Just before you enter the text of the table, choose the Tab command. The "tab ruler" will appear on the screen; it looks something like *Figure 8.* Your particular ruler may have the L's in different positions, since the tab ruler displays the tab settings at the current location in the document. The L stands for left-aligned tab.

2. Use Delete EOL (<Ctrl><End>) to clear the current tab settings. The L's will disappear from the tab ruler.

3. Using the right arrow key, move along the ruler and type an L at the location you would like to set a tab. To delete a tab setting, position the cursor on the tab you want to remove and press <Del>. For the example we have been working with, you need only one tab position at roughly 3 inches from the left margin. Of course you can set the tab location as close to or as far away from the text as you want, depending on the effect you are trying to achieve.

4. Exit from the tab command by pressing <F7><Enter><Enter>. If you don't exit with <F7> your tab settings will be lost.

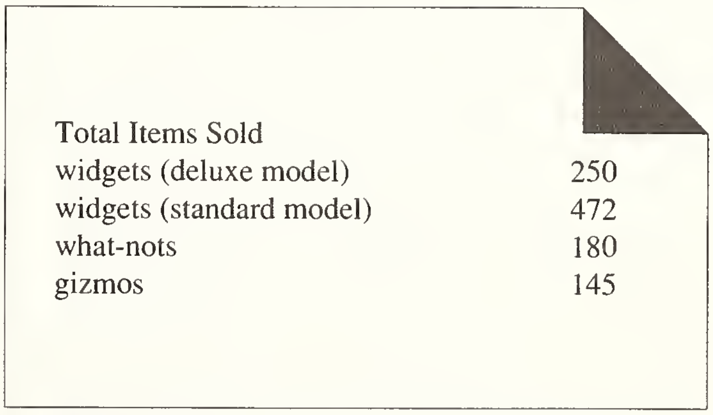
Now type the text of the table. Remember, you only have to press the tab key once between the text and the numbers. Usually the text will appear properly aligned on the screen. More importantly, it will print correctly. I've corrected the text (see *Figure 9*) and presented the printed results in *Figure 10.*



```
Total Items Sold
widgets (deluxe model)      250
widgets (standard model)    472
what-nots                   180
gizmos                      145

TAB                         |
#                           1
```

Figure 9: Non-proportional screen text with only required tabs set.



Total Items Sold	
widgets (deluxe model)	250
widgets (standard model)	472
what-nots	180
gizmos	145

Figure 10: Proportional text with only required tabs set.

The added advantage of setting up tables in this manner is that if you decide that the numbers should be closer to or further away from the text, you only have to change the definition of the tab location and the table will realign itself without any further work! Use Reveal Codes (<Alt><F3>) to make certain you position yourself properly in the document so that the new settings override the old ones. Better still, delete the old settings, then create new ones. Don't worry if your table becomes temporarily jumbled, it will realign itself as soon as the new tab settings are defined. By the way, in Reveal Codes mode, the reverse video line separating the text from the revealed codes uses small triangles (▲) to indicate the tab setting in effect at the current cursor position.

To set tabs in Word 5.0 follow these steps:

1. First clear all existing tab settings using ESC, Format, Tab, Clear-all.
2. Choose the Format, Tab, Set command and press <F1>. Using the right arrow keys, move along the tab ruler to the location where you want to set a tab. If you press <Ins>, you will insert a left-aligning tab. To delete an existing tab, position the cursor at the tab setting you want to delete and press <Del>. (Word 4.0 works similarly.)
3. Press <Enter> to return to text entry mode. If you press <ESC>, you will lose the new tabs you have just entered.

In the next issue of *ComputerNews* I'll look at how to plan a table, at different types of alignments with tabs, and at other places where tabs should and should not be used.

ProComm Communications Program Seminar

April 11, 1990
1:00 - 3:00 p.m.

ProComm is a general purpose communications program currently available to all U of T faculty, staff, and students. It is suitable for connecting to the many networks on campus.

A seminar has been scheduled to introduce ProComm and its various features: terminal emulation (a number of popular ones will be reviewed); the dialing directory; file transfer protocols, such as Kermit and XMODEM; configuration and modem parameter settings; and the DOS gateway, which allows you to execute DOS commands and other programs while you are still in ProComm.

There is a fee for this seminar. Copies of ProComm are made available at no charge to members of the University, but you must bring your own diskettes (two 5.25" or one 3.5").

To reserve a place in this seminar, please contact Irene Rosiecki at 978-4565.

Free NetNorth (Electronic Mail) Demonstration

April 11, 1990
3:00 - 5:00 p.m.

Anyone interested in sending documents to colleagues or friends reliably, quickly, and inexpensively will not want to miss this demonstration. We will introduce you to the NetNorth/BITNET/EARN communications network, which is accessible from the CMS system. This network connects more than a thousand universities and research institutes in Europe, Asia, and North America. Sending documents or files over the network is very easy to learn.

We will show you how to send mail and files to another institution, and how to talk directly to someone on the network. ***Please note this is a demonstration only.***

Space is limited. If you would like to attend one of these sessions, please contact Irene Rosiecki at 978-4565 to reserve a place.

ARPP Macintosh Research Symposium

Fraser Shein
shein@gpu.utcs.utoronto.ca

The Apple Research Partnership Program (ARPP) will be hosting a one-day research symposium on Friday, April 27 on campus. Throughout the course of the day, University of Toronto researchers will discuss how they have used the Macintosh in their work. Researchers who are investigating various computer technologies will have an opportunity to meet others who already have experienced the decision and development process. A total of ten research projects will be described and demonstrated in a series of half-hour presentations. During a lunch sponsored by Apple Canada, a member of the Apple Advanced Technology Group will speak about technology in the future.

Attendance is free. However, people interested in attending are asked to complete the following form and return it to the ARPP office. Also, there are a few spaces for presenters still available. If you would like to present, indicate your interest and research topic on the form. A final schedule and room arrangements should be available by March 31, and will be mailed to all to people who have expressed an interest.

✂ ---------------------------------

**Apple
Research
Partnership
Program**

A.R.P.P. Office
University of Toronto
Computing Services
Room 213
4 Bancroft Avenue
Toronto, Ontario
M5S 1A1
(416) 978-7828

ARPP Macintosh Research Symposium

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I am interested in: ☐ *attending* ☐ *presenting*

Research topic: ____________________

Microcomputer Short Courses

Irene Rosiecki
rosiecki@vm.utcs.utoronto.ca

UTCS offers various noncredit microcomputer courses to faculty, staff, and graduate students of the University of Toronto. These courses cover a number of software programs available for the PC or the Macintosh. Whether you will be typing a thesis on a word processor, or working with spreadsheets, databases, or desktop publishing, we may be able to help you get started.

Our class sizes are small to allow for much individual attention. Continuing support is available upon completion of a course.

The following is a list of the microcomputer courses taught at UTCS:

Introduction to dBASE IV
Introduction to Desktop Publishing
Introduction to Disk Operating System (DOS)
Electronic Mail Seminar
Excel on the Macintosh
Introduction to FoxBASE+/Mac 2.0
Introduction to HyperCard
Introduction to Lotus 1-2-3
Introduction to PageMaker
ProComm Communications Seminar
Introduction to SAS on the PC
Intermediate SAS – Data Processing
Intermediate SAS – Statistics
Microsoft Word on the Macintosh
Microsoft Word on the PC
Introduction to WordPerfect 5.0
Advanced WordPerfect 5.0 Topics
Introduction to WordPerfect 5.0 for 4.2 Users

To find out about course dates and registration procedures, or to book a place in any of these courses, please contact Irene Rosiecki at 978-4565. Courses are filled on a first-come, first-served basis. The more popular courses fill up quickly, but waiting lists are maintained in case of cancellations.

MathStation: A Computing Environment for UNIX Workstations

Andrzej Pindor
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Spectacular progress in the development of computer hardware has given virtually every scientist and engineer access to either a microcomputer or a workstation. Users now expect to be able to use computers in a more direct fashion than was – and sometimes still is – possible with mainframes. As a result, the developments in hardware are being followed by a corresponding development in software. This trend is strongest for microcomputers, for which a variety of software tools for scientific and engineering applications have appeared. These tools allow users to formulate even complicated numerical problems in a simple, natural way and to receive answers immediately. I have reviewed several of these programs in past issues of *ComputerNews.*

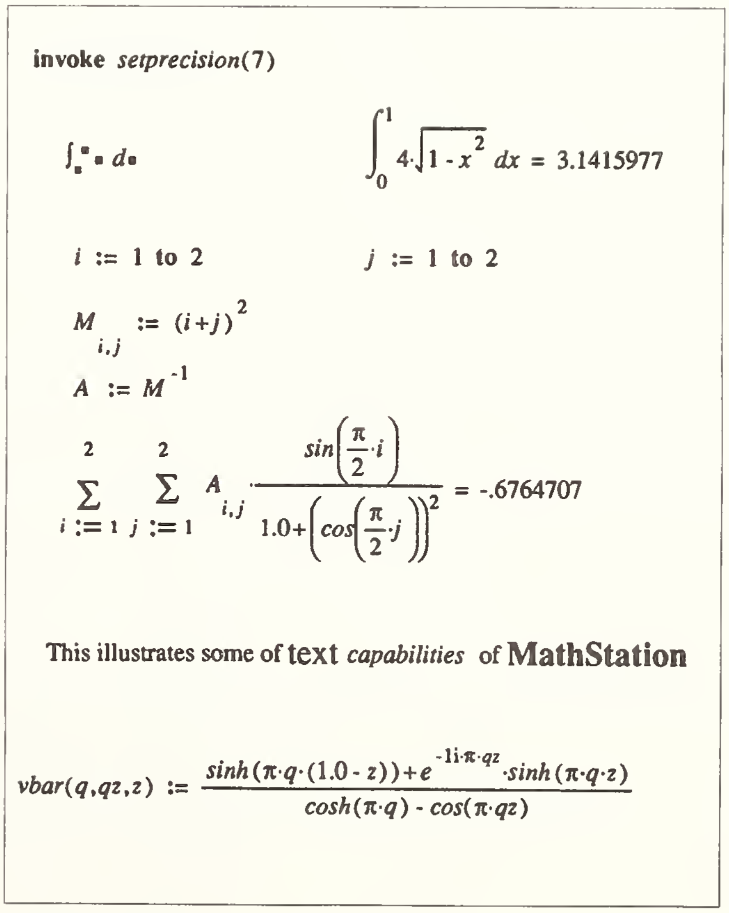
In the March 1989 issue of *PC Magazine,* MathCAD, created by MathSoft, Inc., received very high marks in a comparative review of a large number of packages for scientific and engineering applications. One of its advantages is that it allows mathematical formulae to appear on the screen the way you see them in print or written on paper. (See issues 248 and 252 of *ComputerNews* for my reviews of MathCAD.*)* **MathStation,** also created by MathSoft Inc., is a similarly-spirited but much more powerful software product for UNIX workstations. Due to the sheer power of the hardware for which it is designed, MathStation is not plagued as often by the irritating slowness that afflicts MathCAD when it calculates slightly larger problems. For instance, MathCAD took 49 seconds to multiply two 33 x 33 matrices on a Zenith AT running at 6 Megahertz, whereas MathStation seemed to do it instantaneously on a SUN 3/60 operating with a 68881 coprocessor.

You can consider MathStation a computing environment for both scientific and engineering tasks: it integrates numerical analysis, graphics and text in a flexible way. The following features are worth describing in some detail.

User-Friendly Interface

MathStation presents equations in familiar mathematical notation, with standard symbols like integral, derivative, sum, subscripts, exponents, logical operators, and so on. To calculate an integral, for instance, you first have to create an integral symbol by pressing a combination of two keys. You then fill in the lower limit, upper limit, integrand, and variable over which you want to integrate, and then enter the equal (=) sign. The value of the integral will appear to the right of the equal sign. If you want to calculate this integral using different limits, just change them and press the RETURN key. The new value will replace the old one. In general, the MathStation document is "live." If you change something in it, any results and graphics dependent on the changed quantity will be recalculated or redisplayed.

Figure 1 illustrates the use of the integral operator. On the left you can see what it looks like when invoked and on the right what happens when it is put to work. The last line in *Figure 1* is an example of use of the sum operator, which shows what complicated mathematical formulae look like in MathStation. Complex numbers are handled with the same ease as real numbers.



invoke *setprecision*(7)

$$\int_{\blacksquare}^{\blacksquare} \blacksquare \, d\blacksquare \qquad \int_0^1 4\cdot\sqrt{1-x^2}\,dx = 3.1415977$$

$$i := 1 \text{ to } 2 \qquad j := 1 \text{ to } 2$$

$$M_{i,j} := (i+j)^2$$

$$A := M^{-1}$$

$$\sum_{i:=1}^{2}\sum_{j:=1}^{2} A_{i,j}\cdot\frac{\sin\left(\frac{\pi}{2}\cdot i\right)}{1.0+\left(\cos\left(\frac{\pi}{2}\cdot j\right)\right)^2} = -.6764707$$

This illustrates some of text *capabilities* of **MathStation**

$$vbar(q,qz,z) := \frac{\sinh(\pi\cdot q\cdot(1.0-z))+e^{-1i\cdot\pi\cdot qz}\cdot\sinh(\pi\cdot q\cdot z)}{\cosh(\pi\cdot q)-\cos(\pi\cdot qz)}$$

Figure 1: The use of the integral operator.

MathStation is integrated with the windowing environment of the workstation. It has multiple windows, pull-down menus, scroll bars, etc. *Figures 2* and *3* show examples of SUN screens during a MathStation session. *Figure 2* is one of the sample documents provided with the package. See "Easy-to-Use Graphics" for more details.

Computational Power

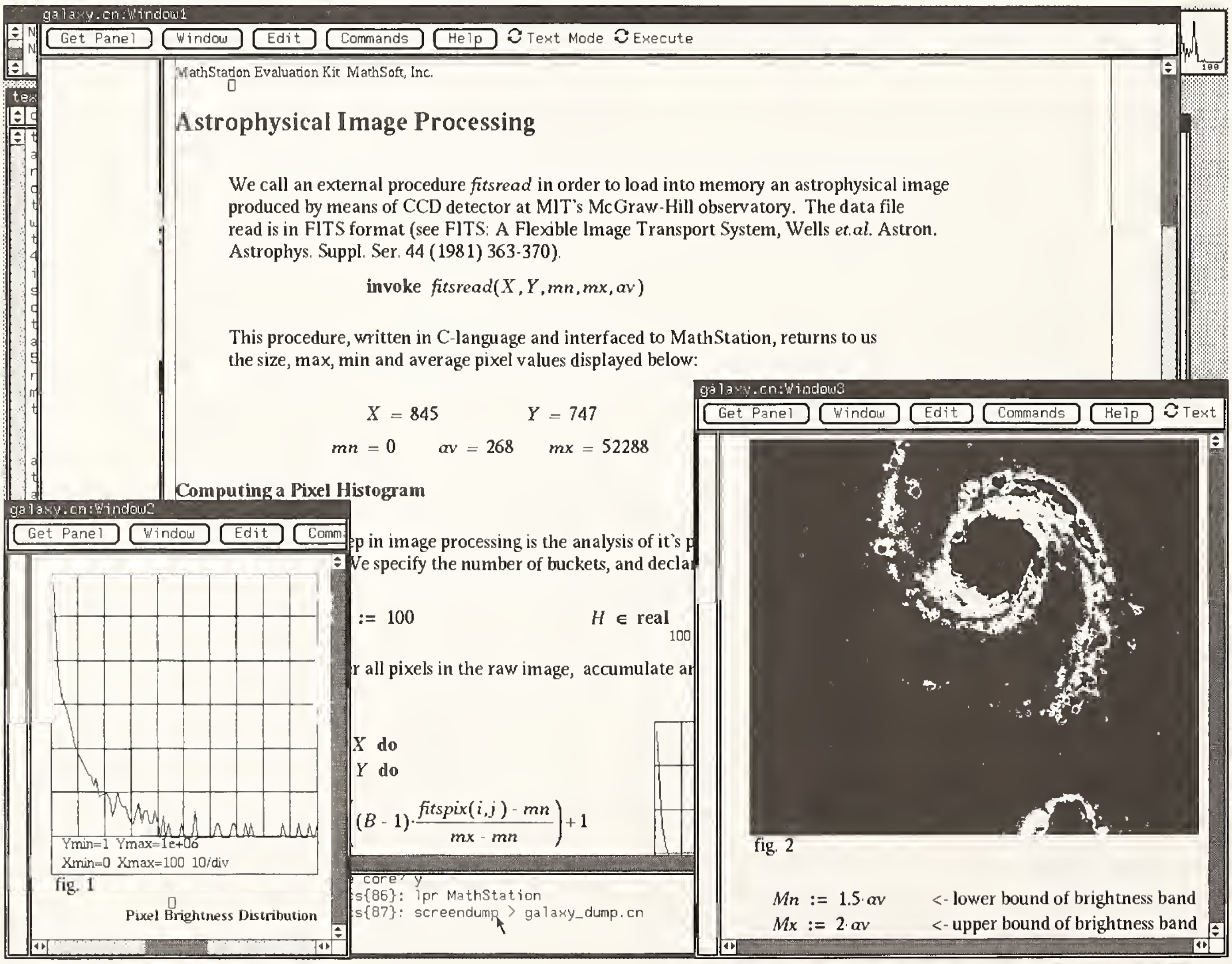
MathStation includes a large number of built-in functions and operators, but you can also define your own, as shown in *Figure 1*. The symbol "1i" is MathStation's way of representing an imaginary unit. Sophisticated procedures and very complicated functions can be defined by using a simple, yet flexible, programming language. An example was illustrated in the January/February issue of *ComputerNews*.

MathStation has an easy interface to Maple, a symbolic manipulation package, which extends the capabilities of MathStation beyond numerics. I was not entirely pleased with the way the symbolic manipulations are incorporated into MathStation. The trouble is that when you manipulate an expression (by factoring or expanding, for instance), the new form of the expression replaces the old one in the document. When you apply several manipulations in succession, it is easy to lose track of how you arrived at the final form. Maple is included with the MathStation package.

FORTRAN Compatibility

MathStation can generate FORTRAN code for all the mathematical expressions entered into the document. This code can be compiled and used to perform calculations, increasing their speed considerably. Many built-in functions and operators are, in fact, compiled FORTRAN or C subroutines. For

Figure 2: SUN screen during a MathStation session.



MathStation Evaluation Kit MathSoft, Inc.

Astrophysical Image Processing

We call an external procedure *fitsread* in order to load into memory an astrophysical image produced by means of CCD detector at MIT's McGraw-Hill observatory. The data file read is in FITS format (see FITS: A Flexible Image Transport System, Wells *et.al.* Astron. Astrophys. Suppl. Ser. 44 (1981) 363-370).

invoke $fitsread(X, Y, mn, mx, av)$

This procedure, written in C-language and interfaced to MathStation, returns to us the size, max, min and average pixel values displayed below:

$X = 845$ $Y = 747$

$mn = 0$ $av = 268$ $mx = 52288$

Computing a Pixel Histogram

p in image processing is the analysis of it's p

Ve specify the number of buckets, and decla

$:= 100$ $H \in \mathbf{real}_{100}$

r all pixels in the raw image, accumulate a

X **do**

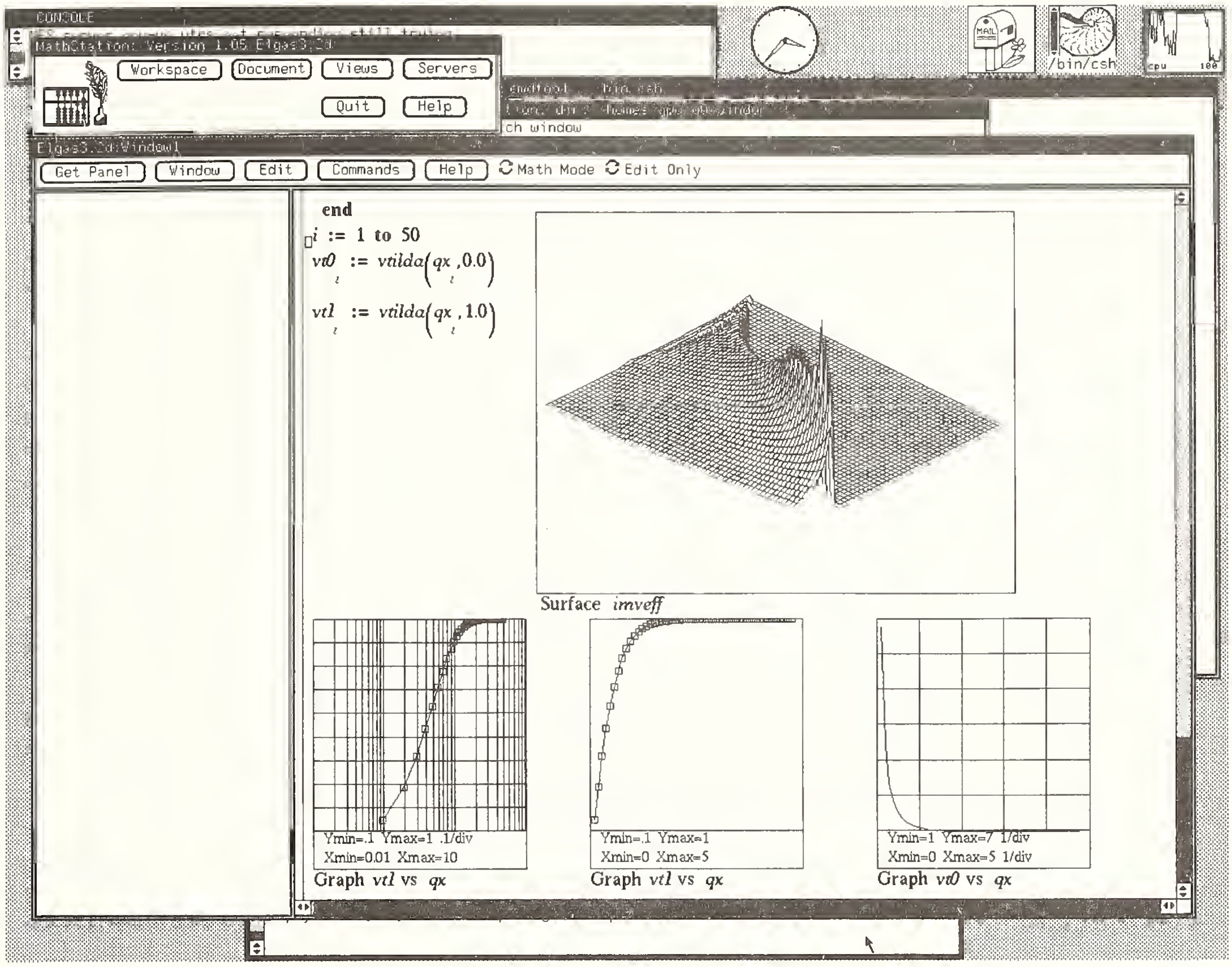
Y **do**

$(B - 1)\cdot\dfrac{fitspix(i,j) - mn}{mx - mn}\Bigg) + 1$

```
 core? y
s{86}: lpr MathStation
s{87}: screendump > galaxy_dump.cn
```

$Mn := 1.5\cdot av$ <- lower bound of brightness band

$Mx := 2\cdot av$ <- upper bound of brightness band



end

$i := 1 \textbf{ to } 50$

$vt0_i := vtilda(qx_i, 0.0)$

$vt1_i := vtilda(qx_i, 1.0)$

Figure 3: Surface plots in MathStation.

instance, the pre-defined integral operator uses the Gaussian Quadrature subroutine from *Numerical Recipes,* by W.H. Press et. al., Cambridge University Press, 1986, page 121. You have access to the FORTRAN source code generated by MathStation and can export it as a source file. Alternatively, external subroutines written in FORTRAN (and in C) can be incorporated into the MathStation environment.

Easy-to-Use Graphics

MathStation is equipped with powerful, easy-to-use graphics. In addition to surface plots (see *Figure 3*) and the usual two-dimensional plots available in a variety of styles, it has built-in procedures for drawing lines and arcs, and for filling regions. Pixel-mapping procedures are also available.

You can create graphs right in your document. As with formulae, they are live. When, for instance, you make a change in an equation that defines a surface that is being displayed, automatically the surface is redrawn to reflect the new definition.

Figure 2 shows the first page of one of the sample documents provided with the package. The two graphs, at bottom left and bottom right, demonstrate how you can use multiple windows to see various parts of a large document without having to scroll. Other documents included with the package demonstrate the use of colours in displaying the Mandelbrot set, plus animation capabilities, which are achieved by displaying images in rapid succession. Further, if you display, side-by-side, two slightly different images in two colours and view them through special glasses (with proper filters for right and left eyes), you can create the illusion of depth. Unfortunately, I do not have a colour monitor, so I was unable to enjoy this feature of MathStation.

High-Resolution Output

MathStation's screen display uses bitmapped graphics to represent various mathematical symbols, and to show a variety of proportionally-spaced fonts (see *Figure 1*). Support for PostScript output devices is provided, allowing you to obtain high-quality prints of documents. *Figure 1* was created by printing a MathStation document on a laser printer. We scanned the resulting print with a DEST scanner, and saved the scanned image as a TIFF (Tag Image File Format) file. This file has been imported directly into this publication. *Figures 2* and *3* were sent directly to a Linotronic 100 typesetter for output, and then were pasted into this publication manually.

MathStation is definitely a very useful tool, able to increase considerably the productivity of a scientist or an engineer using a UNIX workstation. However, it is not without a number of irritating points which can significantly diminish your appreciation of the product. Here is a partial list:

1. Error messages are not very informative. Although they point to the place where an error exists, they often are very cryptic, leaving you guessing at their practical meaning.

2. Although calculations are done quite quickly, particularly if you first compile FORTRAN code corresponding to all statements, MathStation requires a fair amount of time to perform many operations. For instance, closing a current document and opening a new one takes several minutes. It seems that every time MathStation opens a new document it loads all the files necessary to construct its environment, not just those which may differ between the first document and the second. Scrolling through a document containing many formulae is also irritatingly slow.

3. When MathStation performs calculations, its window freezes. It cannot, for example, be sent to the background or closed. Other windows can be laid over it, allowing you to do other things while the program sweats through the particular task given to it, but its window cannot be brought to the front before the calculation has been completed. Worse still, *all* processes running on the machine freeze when additional dialog boxes for some commands appear. Only when you give the required response does the workstation spring back to life. For instance, when you want to save a current workspace under a new name, a box that asks you for the name pops up. I wished sometimes that I could go to a SUNView command window to check the names I had used already, but I could not. Everything stays frozen until you respond to the window's query. The same thing occurs when an error pop-up window appears in order to give you a longer explanation of an error. You can't do anything until you close the window.

4. The accuracy of calculations occasionally leaves something to be desired. See, for instance, the top integral in *Figure 1*. Its value should be π. There is another integral operator that uses a different algorithm and gives a more accurate value for this integral, plus the third operator, which gives control over the accuracy of results, but it operates only in single precision. Even such fundamental constants as π and e are accurate only to seven digits, since they are defined as single precision reals. MathStation can accommodate double precision numbers, real and complex, but since most built-in functions are defined for single precision arguments, using double precision numbers becomes cumbersome.

5. MathStation recognizes the following types of numbers: integer, real, double real, complex, and double complex. Often I wished that conversions between these types were more automatic. MathStation is particularly unforgiving when it comes to types of numerical arguments of functions and procedures.

In spite of the aforementioned reservations, I am sure that MathStation can be a very useful software tool. During the process of evaluation, I frequently talked to MathSoft's staff and found them very helpful and responsive. I am sure that the majority of creases in this otherwise good product will be ironed out soon.

I would like acknowledge the cooperation of MathSoft Inc. in providing me with a free copy of MathStation for evaluation. If there is enough interest in this product on the campus, an additional evaluation period could be arranged to allow other people to try the software.

MathSoft Inc. offers MathStation to educational institutions at a special discount price. For SUN 3, SUN 4 and SPARCSystem workstations, the network license for the first user is US$1250; for 1-4 additional users: US$1150/user; for 5-9 additional users: US$1000/user; and for 10-20 additional users: US$950/user. The MathStation interface to Maple is included in the package at no extra charge.

For more information about this product, contact Andrzej Pindor at 978-5045.

Vendor:
MathSoft, Inc.
201 Broadway
Cambridge, MA 02139-1901
USA
Tel: (617) 577-1017
Fax: (617) 577-8829

CMPCALC3 Turns Your PC into a Calculator for Complex Numbers

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CMPCALC3 is a program that temporarily converts your PC into a programmable calculator for complex numbers. Like Hewlett-Packard calculators, it uses Reverse Polish Notation (RPN). Complex numbers can be handled as easily as real ones.

In addition to basic operations (addition, subtraction, multiplication and division) CMPCALC3 has complex exponential, complex logarithm, complex sine and cosine, complex hyperbolic sine and cosine, and complex square root functions. Since it can store programs of up to 100 commands and save the programs, CMPCALC3 can be used very efficiently for repetitive calculations.

CMPCALC3 has nine labelled storage areas that are displayed on the screen, plus 41 numbered storage areas that are not. The user assigns the names to the labelled areas; the program assigns the numbers to the numbered areas. All stored operations may be saved. You can control the form in which data will be displayed by the name you assign to the storage area. A labelled area whose label begins with POL will display its data in polar form.

CMPCALC3 is copyrighted by UDH Enterprises Inc. A cost-free license, for non-commercial use only, is available to the general public. You can obtain a copy of the license and the program from UTCS by calling 978-HELP. You will have to bring your own 5.25 inch diskette to copy the program.

CMPCALC3 has a much more powerful brother: CMPCALC4. CMPCALC4 has 500 command programs, re-entrant programs, the ability to use several programs at once, increased functions, and telephone support. CMPCALC4 may be purchased for US$49.90 from:

UDH Enterprises,Inc.
1000 E. William St., Suite 100
Carson City, Nevada 89701
USA
(718) 622-8460.

For more information about this product, call Andrzej Pindor at 978-5045.

SPSS V3.1 Upgrade Arrives!

Sandra Gardner
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UTCS has recently received SPSS/PC+V3.1. Current license holders for SPSS/PC+V3.0 may upgrade their software by completely reinstalling with the new version, free of charge. New licenses may be purchased for an annual fee of $100. Please call Shirley MacLeod at 978-4990 to arrange to borrow the diskettes. SPSS/PC+ manuals may be purchased at the U of T Bookstore. The *SPSS/PC+ Update for V3.0 and V3.1 Manual* along with the V2.0 manuals, such as *Advanced Statistics*, provide a complete set of documentation for SPSS/PC+V3.1.

The new features included in our site license version of SPSS/PC+ are: the addition of logistic regression to the Advanced Statistics procedures; new facilities in SPSS Data Entry II such as password protection, extended help, and improved cleaning and skip-and-fill rules; an upgrade to the Graph procedure which allows an interface between SPSS/PC and Harvard Graphics and Draw Applause; more memory is available for using the Execute command with external programs.

SPSS/PC+ also has two new sets of procedures which are not part of our site license. The first is SPSS/PC+ Categories for optimal scaling and conjoint analysis. And the second is SPSS/PC+CHAID, chi-squared automatic interaction detection, which is a standalone software package. Please contact SPSS, Inc.'s Micro Software Sales Representative at 1-312-329-3300 if you are interested in purchasing either of these sets of procedures.

If you have any questions regarding SPSS/PC+ please call Sandra Gardner at 978-5128.

IGOR – Graphing and Data Analysis Software for the Macintosh

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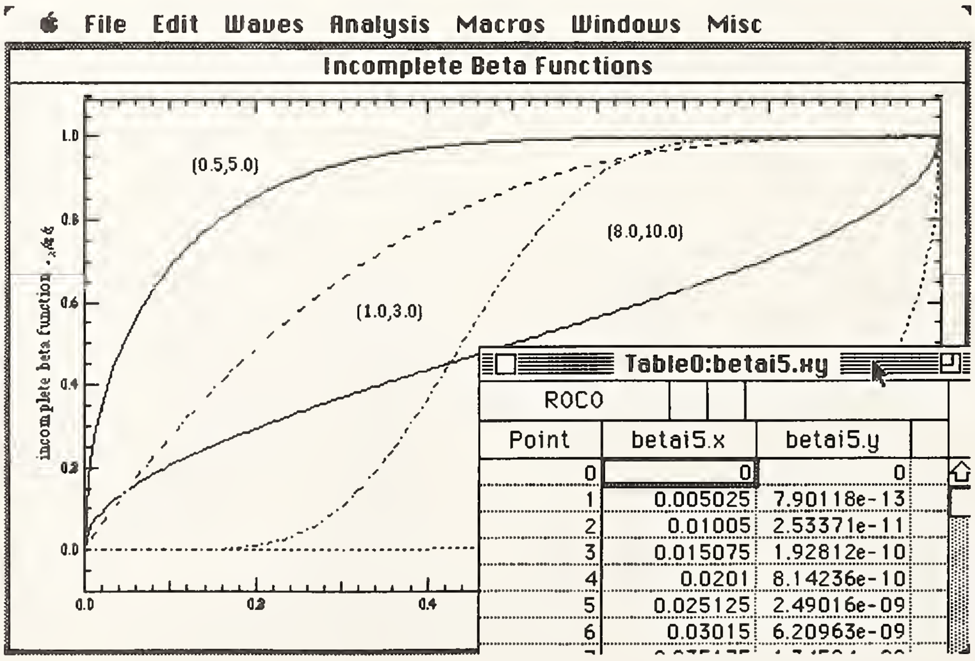
The **IGOR** (Interactive Graphics Oriented Research) program is an inexpensive and friendly software tool designed specifically for researchers who consider visual representations of their data to be of primary importance. Though IGOR handles only two-dimensional data, it has a wide range of built-in transformations that can be applied to the data. Using the command language provided by the program, even more transformations can be created. IGOR runs from either menus (standard Macintosh interface) or from a command window. To exploit the true potential of the program, the use of macros, which is explained later in the article, is necessary. A context-sensitive online help system provides quick and easy references to operate IGOR effectively. If your machine has a floating point co-processor, IGOR will use it for almost all calculations.

The program requires a Macintosh with at least 1 megabyte of random access memory, with a minimum of 700 kilobytes reserved for IGOR. Two floppy disks can be used, but running IGOR from a hard disk is more efficient. IGOR runs properly on 68020, 68030, and 68000-based systems.

An original feature of IGOR is its data structure called waves. Specifically, a wave is a named collection of data points and related scaling information, similar to a column of numbers in a spreadsheet but with additional information. A single wave represents evenly-spaced data. The numbers in waves are, by default, single precision floating point, though they can be double precision and also complex. A real wave is a little like a spreadsheet with two columns: one column representing x-values (evenly spaced as mentioned above) and the other representing y-values. A complex wave has three columns: x-values, real parts of y-values, and imaginary parts of y-values. It is worth noting that the x-values are not stored in memory but are calculated when necessary (e.g., when the wave is displayed in a spreadsheet form) from the scaling information. See *Figure 1.*

Data in waves can be loaded from external text files or can be created by the user with the help of IGOR. Though the data is not limited in the number of rows, it is limited to a maximum of 250 columns and 5,000 characters per row. When importing, the data may be comma, space, or tab-delimited. There is a large number of mathematical functions available for creating or manipulating waves (see following). IGOR's ability to read text files produced by



Point	betai5.x	betai5.y
0	0	0
1	0.005025	7.90118e-13
2	0.01005	2.53371e-11
3	0.015075	1.92812e-10
4	0.0201	8.14236e-10
5	0.025125	2.49016e-09
6	0.03015	6.20963e-09

Figure 1: IGOR calculates x-values when necessary.

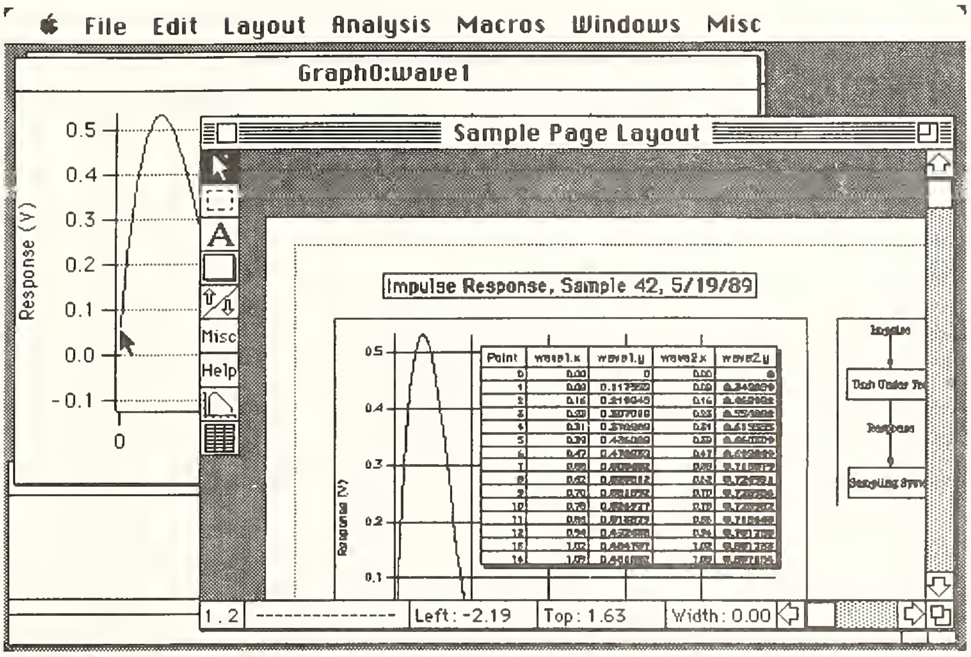


Figure 2: IGOR Page Layout window.

other packages was tested successfully by reading a text file created by JMP (see *ComputerNews* #259, November/December 1989). A useful feature of IGOR is its ability to ignore text labels for columns, which tend to accompany text files.

The simplest graph that IGOR can create is a plot of x- and y-values of a wave. This is achieved with the command DISPLAY WAVE1, where WAVE1 is the name of a wave to be plotted, or by choosing the appropriate menu item. An arbitrary number of waves can be displayed on the same plot by separating their names with commas in the DISPLAY command. New waves can be added to a graph using the APPEND command. Plotting unevenly spaced data requires two waves, one for the x-axis information and the other for the y-axis information (called the parametric plotting mode).

The DISPLAY command creates a graph with the default name "Graph0" and displays it in a separate window. This window can be manipulated just like any Macintosh window. The graph window is interactive, so you can put the cursor on displayed waves and move them along the wave to read the corresponding coordinates, zoom into a portion of a graph using the "marquee" (selection range), add waves, remove waves, change axis specifications such as margins or offsets, add labels at arbitrary positions, and so on. Graphs are also dynamic: if you change a wave, all graphs containing that wave will change correspondingly.

A subsequent DISPLAY command will create another graph (Graph1) in a new window. By referring to the name, you can choose which graph you want to work with. Graphs can be saved and used in another IGOR session, copied to the Macintosh clipboard in PICT format, or saved in PICT format in a separate file.

For the plotted points, there are 22 types of markers with 9 different sizes which can be drawn with various thicknesses. For the graph, you can choose to have only the points drawn, points connected by lines (five different styles), or connecting lines only. You can also have the points represented in the form of a histogram, with several styles for the fill pattern. There are also other modes of data presentation available like "Cityscape" (data points connected by steps), "Lines from zero" (each data point is connected by a straight thin bar to the zero line), and "Fill to zero" (regions between a line connecting the data points and the zero line are filled). Data points can have error bars added to them in a variety of ways, with almost all imaginable combinations.

Data can also be presented in a tabular form by creating tables in table windows. Similar to graphs, you can choose which table you want to work with by referring to its name. Tables are also updated dynamically so that any changes made to a wave will be reflected in the table. Furthermore, tables can be used to manipulate waves in a wide variety of ways and then saved for use in another IGOR session.

IGOR has special windows called page layouts (layouts for short) which allow you to create pages containing graphics, tables, text boxes, and PICT graphics imported from other applications. The wide variety of tools for layout composition will satisfy most needs. An example of an IGOR layout is given in *Figure 2.*

The data analysis capabilities of IGOR include curve fitting, Fourier transforms, wave statistics (like minimum, maximum, average, and standard deviation), histograms, sorting, smoothing, integration, differentiation, and so on. There are many mathematical functions available, elementary functions as well as more exotic functions like Bessel and gamma. For curve fitting, you have a choice of several built-in options like linear, polynomial, sine, exponential, double exponential, Gaussian, or Lorentzian. You can define your own fitting function, as well. Graphs of the resulting curves may then be superimposed on top of the original data.

Though much can be achieved using menu choices, only the use of macros will tap the full potential of IGOR. Macros are procedures that you create which invoke built-in functions and commands or other macros. Conditional (if-else) and looping control structures can be used in macros which, together with the ability to define variables, gives macros full-fledged programming capabilities. IGOR also has a batch file feature that will allow you to interface IGOR with another program written in another language, such as BASIC or HyperTalk. Because IGOR runs well under MultiFinder, you can combine jobs like running an IGOR task in the background while working in Microsoft Word in the foreground, or vice versa – assuming, of course, that you have enough memory.

IGOR could also be improved. For instance, although it can print graphs in colour on colour printers, it displays them only in black and white. Graphing, flexible as it is, lacks the ability to display three-dimensional data – not even in the form of contour graphs. Surface graphs would also be a welcome addition. Furthermore, IGOR is not suitable for certain scientific and engineering purposes where the use of matrices is required.

In conclusion, IGOR is a friendly, inexpensive package for people who use Apple Macintosh computers, work in the science or engineering field, and need a software tool for relatively simple data visualization and analysis.

Vendor:

WaveMetrics,
P.O.Box 2088,
Lake Oswego, OR 97035,
1-503-635-8849
USA

Hardware Requirements:

Macintosh with 1Mb or more RAM,
Hard disk recommended, but two floppies will suffice,
Floating point co-processor recommended.
Macintosh Operating System version 3.2 or later required.
Price: US$195

For more information, call Sandra Gardner at 978-5128 or Andrzej Pindor at 978-5045.

ComputerNews Direct-Mail Renewal a Success

Maureen Monné
monne@utcs.utoronto.ca

Last November, University of Toronto Computing Services decided to adopt a different approach to subscription renewals. Instead of running renewal forms in both the October and November/ December issues of *ComputerNews*, we thought we would see what kind of response a direct-mail notice would bring.

The result was overwhelming. We received over 950 replies to the approximately 1200 notices we sent out, most within four weeks of the date of mailing.

Although we did not provide a space for reader comments, some of you took the time to share your thoughts with us. Comments ranged from "Good idea!", regarding the new renewal process, to blush-inspiring flattery.

> "Yes! I love it!"

> "Thanks for renewal. Enjoyed some of the best written articles in *ComputerNews*. Keep up the good work."

> "The *ComputerNews* provides good information. Please keep up the good work. Thank you for continuing the subscription."

New subscribers and those with address changes who completed the subscription request form included in every issue had something to say as well.

> "All issues are outstanding. Keep up the good work."

> "Very helpful summary of services. Our department is planning to expand our computing capacity in the years ahead and every member will be alerted to your services."

> "Great! Please keep me on your active mailing list!"

> "On the whole, this publication is a very high quality and informative source of information. Each issue seems to get better! Congratulations."

> "Excellent documentation on hands on issues."

You can rest assured that we will make every effort to maintain the quality you have come to expect from us. We hope that you will choose to renew again. (And those of us who are responsible for maintaining the subscription list hope that you will not use the same boundless measures of tape, glue, rubber cement, and staples when you send in your renewal forms next year....)

Documents at UTCS

Vendor-produced documentation may be ordered through the UTCS Information Office, Room 201, 4 Bancroft Avenue. UTCS documents and selected vendor documents are also stocked there for purchase. For more information on prices, call 978-4990. Whenever feasible, documents are made available online, and users are encouraged to print their own copies. On the VM machine, a special command has been provided for this purpose.

To print online documents on:

IBM VM/CMS	***GP UNIX***
Type "help document"	Use *ipr* command

The following examples relate to the table below. The document to be printed is the UTCS Guide to Census Tapes, called CENSUS LISTING on CMS and /usr/doc/utcs/census on GP UNIX. <RETURN> means RETURN or ENTER key.

CMS:

```
document <RETURN> <RETURN>
laser census listing (forms yxle <RETURN>
```

GP UNIX:

```
nohup ipr -8p -fyxle /usr/doc/utcs/census & <RETURN>
```

UTCS Documents in hardcopy

New:

UTCS Rate Schedule (Commercial)
UTCS Rate Schedule (External)
UTCS Rate Schedule (Internal)

Previously announced:

Academic's Guide to Microcomputer Systems
Character Sets for Highspeed Printing
UTCS GUIDE TO PRODUCTS AND SERVICES: Introduction
UTCS GUIDE TO PRODUCTS AND SERVICES: Basics
UTCS GUIDE TO PRODUCTS AND SERVICES: Accounting
UTCS Catalogue: Numerical Products
UTCS Catalogue: Statistics Products
UTCS Guide to Census Tapes
UTCS Guide to Kermit
UTCS Guide to Micro File Transfer Service
UTCS Guide to Text Processing on GP UNIX

UTCS Documents online

	CMS LISTING	GP UNIX	Forms Code
Recently Updated:			
UTCS Guide to Highspeed Printing	PRINT		*
UTCS Guide to VM/CMS	CMSGD		*
UTCS Guide to WScript	WSCRIPT		*
VMTAPE Messages and Codes	VMCMSGS		YXOE
VMTAPE User's Guide	VMCUSER		YXOE
Recently Removed:			
UTCS Guide to Scribe			
UTCS Guide to TFW.MAK in Scribe			
UTCS Catalogue: Text Products			
UTCS Guide to Micro Laser Printing Service			
Previously announced:			
UTCS GUIDE TO PRODUCTS AND SERVICES: Introduction	INTRO	/usr/doc/utcs/intro	*
UTCS GUIDE TO PRODUCTS AND SERVICES: Basics	BASICS	/usr/doc/utcs/basics	*
UTCS Catalogue: Access, Part 1	ACCESS1	/usr/doc/utcs/access1	*
UTCS Catalogue: Access, Part 2		/usr/doc/utcs/access2	*
UTCS Catalogue: Numerical Products	NUMCAT		*
Product-Function List	NUMLIST		BXQD
UTCS Catalogue: Statistics Products	STATCAT		*
Product-Function List	STATLIST		BXQD
UTCS Guide to BMDP	BMDP		*

* *Recommended forms code for the 8700 is YXLE unless otherwise stated.*
† *Use the 87set command. Type "help 87set".*

Documents continued

UTCS Documents online continued

	CMS LISTING	GP UNIX	Forms Code
UTCS Guide to Census Tapes	CENSUS	/usr/doc/utcs/census	*
Recipes for Using Tapes on VM/CMS	QUIKTAPE		*
UTCS Guide to FORTRAN on VM/CMS	FORTRAN		*
UTCS Guide to GP UNIX		/usr/doc/utcs/gpunix	*
UTCS Guide to Kermit	KERMIT	/usr/doc/utcs/kermit	*
UTCS Guide to SAS	SAS		*
UTCS Guide to Series/1 Terminal Use	SERIES		*
3270 Emulation:			
Cybernex APL100 and Volker Craig VC404	CYBER		*
DM1520	DM1520		*
Hardcopy Terminal	HARDCOPY		*
IBM 3101	IBM3101		*
IBM PC Kermit	PCKERMIT		*
SOROC IQ	SOROC		*
VT52	VT52		*
VT100	VT100		*
UTCS Guide to SPSS	SPSS		*
UTCS Guide to Text Processing on GP UNIX		/usr/doc/utcs/text	YXOG

Other Documentation online

Electronic Mail			
A User's Guide to Electronic MAIL	MAILBOOK		YXOC
Kermit			
Kermit Protocol Manual	KERMITPM		YXOE
Kermit User Guide	KERMITUG		YXOF
ProComm			
ProComm Reference Manual	PROCOMM		YXOE
VMBATCH Documents			
VMBATCH User's Guide	VMBATCH		YXOA
VMBATCH Messages and Codes	VMBATMC		YXOA
VMSECURE			
VMSECURE User's Guide	VMSECURE		YXOE
VM Tape Documents			
TapeMap User's Guide and Reference	TAPEMAP		*
Waterloo SCRIPT			
Reference Manual	WSCRPTRF		YXLC
User's Guide	WSCRPTUG		YXLC
Using SCRIPT in MVS/TSO	WSCRPTSO		YXLC
Waterloo SCRIPT and a PostScript Printer	WSCRPTPS		YXLC
Formula Processor Summary	WSCRPTFP		YXLC
GML User's Guide	GMLUG		YXLC
GML Reference Summary	GMLRFSUM		YXLC

* *Recommended forms code for the 8700 is YXLE unless otherwise stated.*
† *Use the 87set command. Type "help 87set".*

Consulting and Enquiries

Applications Support & Advising Supervisor	Alex Nishri	BC214	978-7109
External Marketing Consultant	Ihor Prociuk	BC217	978-6875
Erindale College	Joe Lim	ER2035	828-5311
Information Office	Shirley MacLeod	BC201	978-4990
Account & Access Code Enquiries	Sylvia May	BC101B	978-7148
IBM & Macintosh Maintenance	Kam Mark	BC103	978-5050
Tape Library (Academic Services)	Susan Kovago	MP368	978-7319
Tape Library (Administrative Services)	Miranda Fong	MP368	978-6693
Communication, Networking & Hardware	Rosi Derka-Tseu	BC105	978-7087
UTCS Noncredit Short Courses	Irene Rosiecki	BC217	978-4565

Consulting & Advising Services:	978-HELP
CMS, and GP UNIX userids:	ADVISOR
CMS Userid for mail problems:	POSTMSTR
System Status Enquiries (GP UNIX)	978-4318
System Status Enquiries (IBM)	978-7393
Interactive Services 300 (bps)	978-3959
Interactive Services 1200 (bps)	978-3959
Interactive Services 2400 (bps)	978-7239

UTCS Directory

Director:	Dr. Warren Jackson	BC118	978-8948	wcj@vm.utcs.utoronto.ca
Associate Director:	Eugene Siciunas	BC116	978-5058	eugene@vm.utcs.utoronto.ca
Managers:				
Communications &Technical Support	Norman Housley	BC121B	978-4967	norman@vm.utcs.utoronto.ca
Information Centre	Don Gibson	BC217	978-7331	don@vm.utcs.utoronto.ca
Internal Systems Support	Ron Vander Kraats	BC121A	978-4428	rvk@vm.utcs.utoronto.ca
Operations Support	Dr. Bob Chambers	MP350	978-7092	
Systems Support	Bill Lauriston	MP331	978-3579	bill@vm.utcs.utoronto.ca

Committees on Computing

Supercomputer Users' Group at U of T	Chair	Prof. W.R. Peltier	978-2938
Research Board Standing Committee on Computing	Chair	Prof. C.C. Gotlieb	978-2986

Legend

BC = Bancroft Building
ER = Erindale
MP = McLennan Physical Labs

* NetNorth/BITNET/EARN

UTCS Terminal and Advising Sites

Names and Locations

Central Advising Office (CAO), 978-HELP
Engineering Annex (EA, CDF), 11 King's College Road, Rooms 103, 107, 107B, 201, 203
Erindale College (Erin), 828-5339, 3359 Mississauga Road North, Erindale Campus, Rooms 2037, 2039A-B-C, 2045
Robarts, Robarts Library, 130 St. George St., Room 1061A
Sidney Smith (Sidney), 100 St. George St., Rooms 1071, 2105
St.Michael's College, 121 St. Joseph St., Room 107
Trinity College, 6 Hoskin Ave., Room 024
Victoria University, 73 Queen's Park Cres., Room 208

Access Hours

Sites	Hours of Access				Restrictions*	Advising
	Mon-Thurs	Fri	Sat	Sun		
CAO	10:00-18:00	10:00-18:00	closed	closed	Research	978-HELP
CDF	24 hrs	24 hrs	24 hrs	24 hrs	Undergrads	No
EA	24 hrs	24 hrs	24 hrs	24 hrs	None	978-HELP for Research
Erin (2039)Δ	9:00-17:00	9:00-17:00	12:00-16:00	12:00-16:00	Research	Rm 2005
(2045-46-47)	24 hrs	24 hrs	24 hrs	24 hrs	Undergrads	Rm 2005
(235)†	8:00-22:00	8:00-17:00	closed	closed	None	Rm 2046
Robarts	8:30-24:00	8:30-24:00	9:00-22:00	13:00-22:00	None	978-HELP for Research
Sidney	7:00-24:00	7:00-24:00	7:00-24:00	7:00-24:00	None	978-HELP for Research
St.Michael's	24 hrs	24 hrs	24 hrs	24 hrs	None	978-HELP for Research
Trinity	8:00-22:00	8:00-22:00	8:00-22:00	8:00-22:00	None	978-HELP for Research
Victoria	8:30-21:00	8:30-21:00	8:00-13:00	8:00-13:00	None	978-HELP for Research

Sites	Advising Hours
CAO	Monday through Friday, 10:00 - 18:00
Erin	Monday through Friday, 09:00 - 22:00

Legend

* Research includes graduates, faculty, staff.
Δ Key access available.
† Access restricted to building hours.

Computer and Printer Access

Sites	PACX	Printers	CDF/PC Microcomputers
CDF	N	Y	N
EA	Y	Y	N
Erin	Y	Y	N
Robarts	Y	Y	Y †
Sidney	Y	Y	Y††
St.Michael's	Y	Y	Y††
Trinity	Y	Y*	Y††
Victoria	Y	Y*	Y††

(Y=yes, N=no)

* CDF/PC only † NEC †† TI/PC

UTCS Services

UTCS Centrally Owned and Managed

Systems

IBM VM/CMS
Technical Assistance: 978-6602

- General Purpose Timesharing environment
- Hub of the NetNorth network with access to BITNET, EARN and the Internet
- 4381-R02 processor with 32 megabytes of memory
- CP operating system, VM/SP HPO R5
- CMS timesharing system, VM/SP Release 5
- FTP and TELNET access to the campus ethernet, as well as Internet
- RSCS spooling system, Release 2.3

GP UNIX
Technical Assistance: 978-8853

- General Purpose Timesharing under SUN UNIX 3.2
- SUN 3/280, 8 megabytes of memory
- access to Linotronic typesetter
- offers a sophisticated and powerful environment for text processing
- offers a sophisticated programming environment suitable for commercial software development or testing
- full access to USENET, an electronic technical information exchange facility
- offers excellent electronic mail facilities and ability to send or receive mail from most computer networks worldwide, such as UUCPNET, ARPANET, NetNorth, BITNET, CSNET, CDNNET

Services

Communications, Networking & Technical Support
Primary Phone: 978-7087

- Communications Group provides communications systems, terminals, modems, data channels: consulting and installation.
- Field Service Group installs and maintains communications and computer systems, particularly IBM PCs, Micro Vaxes, and Macintoshes, on a contract basis or on a cost-per-call basis.
- provides consulting on computer systems technology and installs computer systems
- provides access between the IBM systems and machines using UNIX, VMS and other operating systems. Ethernet, Pronet, and IBM TRN technologies are used over various transmission media including optical fibre. More basic communications techniques are also used for moderate speed links.
- provides consulting on local area networking and installs LANS
- provides access to NetNorth (BITNET), the North American Universities Network; ONET, the Ontario Regional Network; and USENET, the UNIX networking fraternity
- provides gateway to the US Internet
- will provide a communications solution to department needs on a contractual basis

Information Centre
Primary Phone: 978-HELP

- Provides assistance in use of electronic messaging, including use of Local Area Networks (LANS); NetNorth/BITNET/EARN, the world Universities network; CDNNET, the Canadian X.400 network; ARPANET; CSNET; USENET; and other international connections.
- provides advising, consulting and documentation on:
    - command languages, including CMS and UNIX
    - high-level languages, including FORTRAN, and C
    - packages and libraries, including SAS, SPSS, BMDP, IMSL, and NAg
    - editors and formatters, including XEDIT, ed, nroff/troff
- provides general micro support
    - selection consulting for hardware and software
    - Micro Lab for evaluation of hardware and software
    - advice on University discounts
    - media conversion and data transfer
    - CD-ROM access to software and information discs
    - offers PostScript Laser Printing Service
    - offers 35mm slide production service using Polaroid Palette
    - administers Local Area Network of PCs for Education Facility
    - administers Macintosh Education Facility
- high-quality typesetting
- provide image and typed text scanning
- installs and maintains application packages
- administers site licenses for various software packages
- provides short courses and seminars on the more popular services and software packages

> *The mandate of UTCS is to encourage and support the use of information technologies across campus, and to plan, implement, and operate common-carrier networks and certain appropriate central computer facilities.*

Facilities Managed by UTCS

Administrative Computing

- administrative IMS, DB2, Batch, and TS0
- 3081K processor, 48 megabytes of memory
- MVS/XA operating system

Computer Disciplines Facility/UNIX

SUN 3/280s, 16 megabytes of memory (zero.cdf)
- Computer Science interactive access
- SUN UNIX 4.0.3

SUN 3/280s, 16 megabytes of memory (one.cdf)
- Computer Science interactive access
- SUN UNIX 4.0.3

Computer Disciplines Facility/PC

- 40 NEC computers connected in a Local Area Network
- 66 TI Professional Computers connected in a Local Area Network
- introductory Computer Science instruction
- MS-DOS with Turing environment

Erindale College Systems

VAX 8200, 8 megabytes of memory
- instructional access using VMS
- research access

VAX-11/750, 5 megabytes of memory
- instructional access using UNIX (Berkeley UNIX 4.3BSD)

Institutional Relations System

VAX-11/750, 8 megabytes of memory
- database services to the owner departments using VMS

EPAS Facility

- 4361-5 processor, 16 megabytes of memory
- general VM/CMS services to the owner departments

Ontario Centre for Large Scale Computation (OCLSC)

- Cray Research Inc. X-MP/24
- 2 processors, 4 megawords main memory
- solid state disk (SSD) with 64 megawords of storage
- COS 1.17 operating system
- VAX 8350 + MicroVAX II and VAX750 provide VMS front-end services

UTCS Site Licenses

UTCS administers a number of software site licenses available to the University of Toronto community. (Usually, this means faculty, staff, and graduate students, though some licenses apply to undergraduate students also. See "Restrictions" in the table below.) The licenses provide a variety of software at much-reduced cost. The majority of the licenses must be renewed each year. Most are terminated when you leave U of T.

Each license has a contract that you must complete. It outlines your responsibilities and any limitations in the use of the software. Except for ProComm, the contracts and software are available from the UTCS Information Office, 4 Bancroft Avenue, Room 201. ProComm is available from the UTCS Advising Office, 978-HELP. To qualify as a member of the U of T community, you must provide a valid Employee number or Student number.

The table below describes the available site licenses. The Restrictions column specifies who may purchase the license. If the restriction is U of T Research, the payment must come from research money. The Diskettes column describes how you actually receive the software. Large packages, like SAS and SPSS, require that you borrow the diskettes, install the software, and return the diskettes. Smaller packages, consisting of up to five diskettes, either require you to bring your own diskettes or include the costs of the UTCS-supplied diskettes in the license fee.

For more detailed information about these site licenses, telephone the UTCS Information Office at 978-4990.

Site Licenses at UTCS

Product Name	***Archivist***	***Chaos in the Classroom I: Maps and Bifurcations***	***Procomm***
System	PC; Text management	PC;	PC; Communications
Restrictions	Faculty, Staff, Graduate Students	Faculty, Staff, Graduate Students	Faculty, Staff, Graduate Students, Undergraduate
Cost	$40	$12	Free
License Period	One-time fee	One-time fee	N/A
Diskettes	One 5.25"; bring own	One 5.25" or one 3.5"; bring own	Two 5.25"; bring own
Documentation Available at UTCS	No	Yes	On disk; part of package

Product Name	***QuickMail***	***SAS/PC***	***SAS/PC network***
System	Mac; Electronic mail	PC; Statistical analysis	PC; Statistical analysis
Restrictions	Faculty, Staff	Faculty, Staff, Graduate Students, Undergraduate	Faculty, Staff, Graduate Students
Cost	$25 per user	BASE/STAT/GRAPH: $70; FSP module: $10; IML module: $20; ETS module: $35.	$35 per station
License Period	One-time fee	July 1-June 30	July 1-June 30
Diskettes	One 3.5"; bring own	Deposit $25 per box; 6-10 boxes	
Documentation Available at UTCS	No	Yes	Yes

Site Licenses at UTCS continued

Product Name	***SAS/UNIX***	***SPSS/PC***	***SYSTAT***
System	UNIX; Statistical analysis	PC; Statistical analysis	Mac; Statistical analysis
Restrictions	Faculty, Staff, Graduate Students	Research	Faculty, Staff, Graduate Students
Cost	$150 BASE; $50 ea. FSP, IML modules	$100	$100
License Period	July 1-June 30	Nov 1-Oct 31	July 1-June 30
Diskettes	Tape cartridge	Deposit $25 per box; 2-3 boxes	Five 800KB 3.5" diskettes; bring own
Documentation Available at UTCS	Yes	No	Yes

Product Name	***WATCOM C***	***WATFOR-77***	***WordPerfect***
System	PC; C compiler	PC; FORTRAN compiler	PC
Restrictions	Research	Research	Faculty, Staff
Cost	$35	$35 [$35 WATFOR-87 (math co-processor)]; Add. $5 GKS (Graphics Kermal System)	New: $65 Upgrade: $10
License Period	July 1-June 30	July 1-June 30	One time fee
Diskettes	Ten 5.25" diskettes; bring own	Included in license fee	Deposit $25 per box; 1 box
Documentation Available at UTCS	Yes	Yes	Yes

Software List

SOFTWARE LIST for MICROCOMPUTERS

The following are microcomputer software packages for which UTCS can provide either support or some information. As with mainframe products, micro packages receive full support (Class A), limited support (Class B), or no active support (Class C). The specific criteria differ from those for mainframe classes and are outlined in the Academic's Guide to Microcomputer Systems.

Package/Compiler	Version	Environment	Support
Application Development Tools			
Assembler			
Microsoft Assembler	5.1	MS-DOS 3.3 & OS/2	B
MPW Assembler	2.0.2	Macintosh	B
BASIC			
GW BASIC	—	MS-DOS	B
C			
Microsoft C	5.1	MS-DOS	B
MPW C	2.0.2	Macintosh	B
WATCOM C & Express C	6.0	MS-DOS	B
Module-2			
JPI Top Speed Module-2	1.17	MS-DOS	B
Metacom Module-2	1.0	Macintosh	C
FORTRAN			
IBM FORTRAN/2	1.0	MS-DOS 3.3 & OS/2	B
Language Systems FORTRAN	1.0	Macintosh	C
Microsoft FORTRAN	4.0	MS-DOS	B
WATCOM WATFOR-77	3.0	MS-DOS	A
Pascal			
MPW Pascal	2.0.2	Macintosh	C
TURBO Pascal	—	MS-DOS	B
Tools			
ResEdit	1.2d0	Macintosh	B
HyperCard	1.2.1	Macintosh	A
Macintosh Programmer's Workshop	2.0.2	Macintosh	B
SuperCard	1.0	Macintosh	B
WATCOM GKS	1.3	MS-DOS	B
Communications			
File Transfer & Terminal Emulators			
Kermit	0.8(35)	Macintosh	A
Kermit	2.30	MS-DOS	A
Kermit	—	Apple II DOS	C
Kermit	—	CP/M	C
DeskLink	2.21c	MS-DOS	B
Lap-Link Mac	2.0	Macintosh	B
Lap-Link PC	2.16	MS-DOS	B
MacTerminal	2.2	Macintosh	B
PC TALK3	—	MS-DOS	C
PC PLOT III	—	MS-DOS	C
ProComm	TU 2.4.2	MS-DOS	A
Red Ryder	10.3	Macintosh	B
Remote^2	1.01	MS-DOS	B
Network Systems			
AppleShare	2.0.1	Macintosh	B
Novell Advanced Netware	2.15	MS-DOS	B
STARLAN	3.1	MS-DOS	B
Tapestry II	1.1B	MS-DOS	A
TOPS	2.1	Macintosh	B
TOPS	2.1	MS-DOS	B
TOPS NetPrint	2.1	MS-DOS	B
Network System Utilities			
3COM PLUS	1.3.1	MS-DOS	B
Inter•Poll	1.0	Macintosh	B
PC LAN	1.3	MS-DOS	B

Software List continued

Package/Compiler	Version	Environment	Support
Database Managers			
4th Dimension	Int. 1.03	Macintosh	B
Archivist	1.02b	MS-DOS	B
AskSam	4.2	MS-DOS	B
Clipper	S87	MS-DOS	B
DATAEASE	2.5R3	MS-DOS	B
dBASE IV	1.0	MS-DOS	A
FoxBASE Mac	2.0	Macintosh	B
Notebook II	2.03	MS-DOS	C
R & R Report Writer	3.0	MS-DOS	C
Desktop Publishing			
Fontographer	n/a	Macintosh	C
PageMaker	3.01	Macintosh	A
PageMaker	3.0	MS-DOS	A
Quark XPress	1.0	Macintosh	C
Ready,Set,Go!	4.0	Macintosh	C
Ventura	2.0	MS-DOS	B
Electronic Mail			
Microsoft Mail	1.36	Macintosh	B
QuickMail	1.0	Macintosh	B
Graphics			
Charting			
35mm Express	4.02	MS-DOS	B
Cricket Graph	1.2	Macintosh	C
Freelance Plus	3.0	MS-DOS	B
Harvard Graphics	2.1	MS-DOS	B
Lotus 1-2-3	2.01a	MS-DOS	B
Microsoft Excel	1.5	Macintosh	B
Microsoft Excel	2.0	MS-DOS	B
SigmaPlot	—	MS-DOS	C
Draw and CAD			
Aldus Freehand	1.0	Macintosh	B
Cricket Draw	1.1	Macintosh	C
Generic CADD	3.0	MS-DOS	C
MiniCad	4.05	Macintosh	C
Illustrator	1.0	Macintosh	B
Illustrator88	1.6	Macintosh	B
MacDraft	1.2b	Macintosh	C
MacDraw	1.95	Macintosh	A
MacDraw II	1.0v1	Macintosh	B
Windows Draw	1.02	MS-DOS	C
Image and Scanning			
Corel Draw	1.00	MS-DOS	B
ImageStudio	1.05	Macintosh	B
Publish Pac	2.0	Macintosh	B
Publish Pac	2.1	MS-DOS	B
Text Pac	2.0	MS-DOS	B
Paint			
DR HALO	1.23	MS-DOS	C
MacPaint	2.0	Macintosh	A
Microsoft Paintbrush	2.0	MS-DOS	C
PC Paintbrush	2.5	MS-DOS	C
SuperPaint	1.1	Macintosh	B
Windows Paint	2.03	MS-DOS	C
Plotting Subroutines			
WATCOM GKS	1.3	MS-DOS	B

Software List continued

Package/Compiler	Version	Environment	Support
Numerical			
Derive	1.14	MS-DOS	C
Eispack	n/a	MS-DOS	C
Eureka	n/a	MS-DOS	C
GAUSS	2.0	MS-DOS	B
Linpack	n/a	MS-DOS	C
MathCAD	2.0	MS-DOS	C
muMATH-83	4.12	MS-DOS	C
NAg Workstation Library	Rel. 1	MS-DOS	A
Solver-Q	---	MS-DOS	C
Operating Systems			
IBM PC, PS/2, and compatibles			
AIX PS/2 (Unix)	1.1	n/a	C
IBM OS/2 Extended	1.1	n/a	B
IBM PC-DOS	4.0	n/a	B
Microsoft MS-DOS (incl IBM PC-DOS)	3.3	n/a	A
Microsoft Windows 286	2.1	MS-DOS	A
Microsoft Windows 386	2.1	MS-DOS	A
Macintosh II, Macintosh SE, and Macintosh Plus			
A/UX (Unix)		n/a	C
Finder	6.1	n/a	A
MultiFinder	6.0.1	n/a	A
System	6.0.2	n/a	A
NeXT			
NeXT	0.9	n/a	B
Apple II			
Apple II DOS	3.3	n/a	C
CP/M	2.20	n/a	C
ProDos	1.0	n/a	C
Sound			
SoundWave	1.0	Macintosh	B
MacRecorder	1.0	Macintosh	B
Spreadsheet			
HAL	1.0	MS-DOS	B
Lotus 1-2-3	2.01a	MS-DOS	B
Microsoft Excel	1.5	Macintosh	B
Microsoft Excel	2.0	MS-DOS	B
Statistical			
BASS	88.10	MS-DOS	C
MACSPIN	1.5	Macintosh	C
Minitab	82.1.1	MS-DOS	C
PowerStat	1.04	MS-DOS	C
SAS/PC	6.03	MS-DOS	A
SPSS/PC+	3.0	MS-DOS	A
STATPRO	2.0c	MS-DOS	C
STATWORKS	1.2	Macintosh	B
SYSTAT	3.2	Macintosh	B
SYSTAT	3.2	MS-DOS	B
Word Processing			
Guide	2.0	MS-DOS	C

Software List continued

Package/Compiler	Version	Environment	Support
FinalWord II	2.0	MS-DOS	C
MacWrite	5.01	Macintosh	B
Manuscript	2.0	MS-DOS	C
Microsoft Word	3.02 & 4.0	Macintosh	A
Microsoft Word	4.0 & 5.0	MS-DOS	A
Nota Bene	3.0	MS-DOS	B
Nota Bene SLS	3.0	MS-DOS	B
PC-TeX	2.1	MS-DOS	B
Sprint	1.0	MS-DOS	B
T^3	—	MS-DOS	C
WordPerfect	5.0 & 5.1	MS-DOS	A
WordPerfect	1.0	Macintosh	C
WordPerfect Library	2.0	MS-DOS	C
WordStar	3.3 & 5.5	MS-DOS	C
Utilities			
Apple Turnover	—	MS-DOS	A
Fastback MAC	2.0	Macintosh	B
Fastback Plus	2.0	MS-DOS	B
Norton Utilities	4.5	MS-DOS	A
Copy II MAC	7.2	Macintosh	B
Mace Utilities Gold	—	MS-DOS	B
MacZap	5.1	Macintosh	B
Sidekick for PM	1.0	OS/2	C
TURBO Lightning	—	MS-DOS	C
XenoCopy PC	1.117	MS-DOS	A
386MAX	4.0	MS-DOS	B

SOFTWARE LIST for MAINFRAME COMPUTERS VM/CMS, UNIX

Each programming language or package available at UTCS has a support level. In general, Class A Products receive full support, Class B limited support (as time and resources allow), Class C no active support.

For complete details of UTCS product support policy, see the UTCS GUIDE TO PRODUCTS AND SERVICES: Introduction.

Package/Compiler	System	Support	Version
Communications			
FTP	VM/CMS	C	1.2.1
Kermit	VM/CMS	A	---
Kermit	UNIX	B	4C(058)
FTS	VM/CMS	A	---
MAIL/MAILBOOK	VM/CMS	A	86.359
macget/macput	UNIX	C	---
netcopy, netexec, to (NetNorth Tools)	UNIX	B	---
xmodem	UNIX	C	---
ftp,rsh,rlogin,telnet,rcp (Access via TCP/IP to most of the networked machines on all three campuses)	UNIX	B	---
rn/Pnews	UNIX	B	---
mail,mh,Mail	UNIX	-	---
TELNET	VM/CMS	C	1.2.1
Graphics			
PLOTBASIC (FORTRAN)	VM/CMS	C	---
SAS/GRAPH	VM/CMS	A	5.18
Languages			
ASSEMBLER(F)	VM/CMS	C	---
Concurrent Euclid	VM/CMS	C	1.9
FORTUTILS	VM/CMS	A	2.2
PL/I OPT Compiler	VM/CMS	B	1.5.1
REXX	VM/CMS	A	---
SNOBOL 4	VM/CMS	C	3.5
Turing	VM/CMS	C	---
VS FORTRAN	VM/CMS	A	1.4.1
VS Pascal	VM/CMS	C	2.2
Waterloo C	VM/CMS	C	1.3
WATFIV	VM/CMS	C	V2L0
WATFOR-77	VM/CMS	A	1.3
cc	UNIX	A	---
f77	UNIX	C	---
ratfor	UNIX	C	BSD std.
ttc	UNIX	C	---
pc	UNIX	C	BSD std.
yacc	UNIX	C	---
awk	UNIX	C	---
adb,dbx	UNIX	C	BSD std.
Numerical			
IMSL	VM/CMS	A	9.2,10.0
LINPACK	VM/CMS	C	---
MINOS	VM/CMS	C	5.1
MINPACK	VM/CMS	C	---
NAg	VM/CMS	A	Mark 11, 13
Statistical			
BMDP	VM/CMS	A	Level 85, Level 87
Minitab	VM/CMS	B	5.1
NAg	VM/CMS	A	Mark 11, 13
NTSYS	VM/CMS	C	1987
SAS	VM/CMS	A	5.18
SPSS^x	VM/CMS	A	3.1

Software List continued

Package/Compiler	System	Support	Version
Text Processing			
SCRIBE	VM/CMS	C	4(1400)-1
Waterloo SCRIPT	VM/CMS	B	86.1
XEDIT	VM/CMS	A	---
8700 Pseudotypesetting	VM/CMS	C	n/a
MICROLASER	VM/CMS	C	---
ed	UNIX	A	---
vi	UNIX	C	---
cmacs	UNIX	C	---
spell	UNIX	C	---
diction/explain	UNIX	C	---
eqn	UNIX	B	---
tbl	UNIX	B	---
pic	UNIX	C	---
troff	UNIX	B	---
nroff	UNIX	B	---
TeX	UNIX	C	---
Utilities			
FORTUTILS	VM/CMS	A	2.2
TPRINT	VM/CMS	C	---
TCOPYNL	VM/CMS	B	---
TCOPYSL	VM/CMS	B	---
crypt	UNIX	A	BSD std.
compress	UNIX	C	BSD std.
csh	UNIX	B	BSD std.
diff	UNIX	A	BSD std.
grep	UNIX	A	BSD std.
ipr	UNIX	B	---
learn	UNIX	C	BSD std.
patch	UNIX	C	---
sed	UNIX	A	BSD std.
sort	UNIX	A	BSD std.
sh	UNIX	A	BSD std.
tar	UNIX	A	BSD std.
uniq	UNIX	A	BSD std.

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